Subterranea

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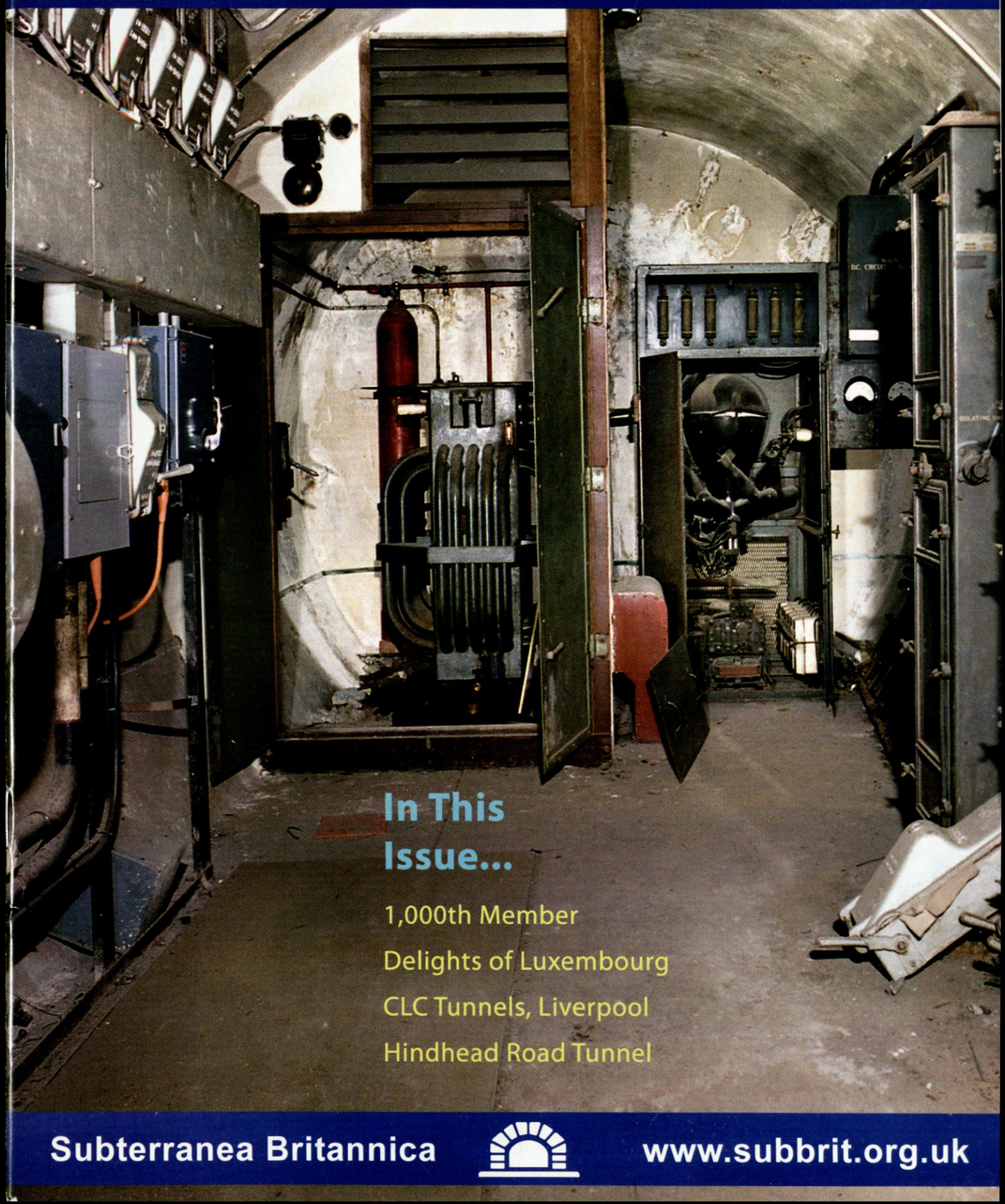

In This Issue...

Subterranea Britannica

www.subbrit.org.uk

Subterranea Britannica is a society devoted to the study of man-made and man-used underground structures and the archaeology of the Cold War. In the case of Cold War structures studies are entirely confined to declassified and decommissioned structures. The society is open to all and its membership includes all walks of life. Members are invited to contribute to this magazine even if this just means sending very welcome snippets from newspapers and magazines.

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Contents

Front cover photo: One of the two lift machine rooms in the Clapham South deep shelter. All the equipment here dates from the 1940s; note the mercury vapour rectifier in the cabinet on the right. This is no longer in use but has been left in place.

Back Upper: Less regular workings in the Pulborough sand mine

Above two photos by Nick Catford

Back Lower: The Sub Brit party inside the Hindhead tunnel. We were unable to leave the minibus once inside the tunnel so this picture was taken by one of our tunnel guides.

Newsletters of Subterranea Britannica are published by the committee of Subterranea Britannica. Original articles, book reviews, press cuttings, extracts from books and journals, letters to the Editor etc are welcome. However the Editor reserves the right not to publish material without giving a reason.

The committee of Subterranea Britannica and the Editor do not necessarily agree with any views expressed and cannot always check the accuracy of any material sent in.

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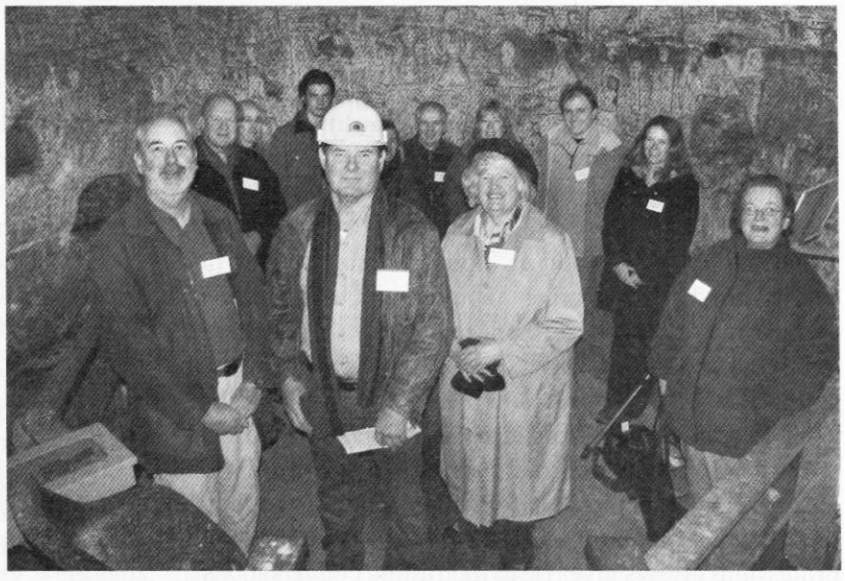
Subterranea Britannica: a Grand Society!

Martin Dixon

Founded in 1974, Subterranea Britannica was established by Sylvia Beamon, inspired by the Templar carvings in Royston Cave (www.roystoncave.co.uk). It was Professor Raymond Mauny, of the Sorbonne in Paris, who suggested the society's name – pointing out that the initials matched Sylvia's own.

Over the years, Sub Brit's interests have extended to include all manner of underground space. Our membership too has grown and we now need full-size meeting space to accommodate our Spring and Autumn gatherings. Over the years Sub Brit has had over 3,000 members and we reached the milestone of 1,000 concurrent subscribing members in November 2009. Our 1,000th member is Robert Lowe, of Saffron Walden in Essex.



Robert Lowe with Sub Brit chairman Martin Dixon left and founder Sylvia Beamon right. Photo by Tim Robinson.

We arranged to meet Robert to formally welcome him into our Society.

What better site to meet than Royston Cave? The very site that had catalysed our creation 35 years ago. Sylvia still lives in Royston and is a qualified guide at the cave and so we met with Sylvia and Robert on a chilly Sunday in February. Although a small group due to insurance limits, it represented a good cross-section of members. Robert's own underground tastes are quite broad but he has a particular interest in military structures. We made a 'token' presentation of a Sub Brit hard hat before Sylvia enthralled us with a description of the cave and its intriguing carvings. The cave is also in the news for other reasons as the carvings are under threat from minute chalk-eating worms.

After this we retired, in true Sub Brit fashion, to a nearby pub where we had an afternoon of good food, company and discussion. I, for one, am confident that Sub Brit will continue to grow and thrive and be around in another 35 years.

From the Chairman

Martin Dixon

It was a great pleasure to meet up with our 1,000th active member Robert Lowe recently. A short report of our meeting at Royston Cave is elsewhere in this edition but it set me thinking what a varied and intriguing bunch of people Sub Brit has as members. When we were founded, most of our members came from a background or interest in what might loosely be called cultural anthropology and archaeology. Many of the sites studied were mediaeval or earlier and often used as living, storage or for ritual ('religious') purposes.

It wasn't long before the sites we visited expanded to cover a wide range of other categories, and with this the diversity of our membership also grew. Mines and quarries added members with an interest in geology and industrial archaeology. Show caves brought members from the potholing community. Transport and utility tunnels added those with expertise in canals, railways and surveying. Military structures both ancient and modern brought in people with a particular interest in the history of combat and defence. And of course more modern military constructions led to an influx of knowledge of civil defence and the Cold War.

Many members are active in other societies – most particularly those with a smaller focus in terms of subject or geography. These include specialist groups such as the Railway and Canal Historical Society and the Pillbox Study Group. Regional societies include local mining clubs, for example the Peak District Mines Historical Society, and groups such GLIAS (Greater London Industrial Archaeology Society). As well as providing us with current and future members, such groups are often rich sources of speakers or of guides for local trips. They are often active in fieldwork which, as a UK-wide society, it is less easy for Sub Brit to set up and resource. Working in tandem with these groups – as well as with national bodies such as English Heritage and the Royal

Commission on the Ancient and Historical Monuments of Scotland – is an important part of increasing Sub Brit's reach and influence.

After joining Sub Brit, many members' interests expand to cover most if not all underground sites. It is however a great strength that we can call on world experts in many of the disciplines that we study. I believe this continued growth and refreshing of Sub Brit is hugely desirable and I am sure will continue. Recent members, for example, have joined us after an initial interest in underground art or in urban exploration. On top of this 'subject matter' expertise, many members use their other skills to support and grow our Society. We could not continue without people – too many to mention – who apply their knowledge in organisation, computing, finance, writing, publication, presentation and photography. If you have skills that could help Sub Brit in the future then don't be backward in coming forward! Sub Brit members' professions always give rise to interesting conversations ranging as they do from (mostly 'on topic') tube train driver to lift engineer and (generally 'off topic') from actor to priest.

In considering the great diversity of members that we have, it is pleasing to see that all ages are represented, from teens through to 80+. The majority of our members are male but we have a large and active female membership. Underground exploration is often difficult and sometimes impossible for those with disabilities. We should, however, always make sure that our activities – especially those above ground – are as accessible as possible to those with disabilities of whatever nature.

The warm welcome that we gave our 1,000th member should apply to *every* new member and I encourage all existing members to go out of their way to get to know and encourage recent joiners. And to those of you reading their first *Subterranea*, I hope it will be the start of a long and satisfying membership.

SUBTERRANEA BRITANNICA DIARY

Summary of Forthcoming Events 2010

Sub Brit specific events

19 June Sub Brit visit to Coleshill Auxiliary Units Training Centre

15 July Copy deadline for *Subterranea 24*

8 & 13 July Visit to 'Aspidistra' / Crowborough RGHQ

31 July Visit to Neatishead Radar Museum & Bunker, Norfolk

4 August Visit to Greatstone sound mirrors (Kent) and Winchelsea cellars (Sussex)

3 – 5 September Sub Brit UK Study Weekend Cornwall

18 September Paddock (standby Cabinet War Room)
Open Day Dollis Hill

16 October SB Autumn Day Meeting, location to be confirmed

Other underground-related events

4 – 6 June NAMHO (National Association of Mining History Organisations)
Conference, Coalpit Heath, South Gloucestershire

12 - 13 June London Open Squares Weekend
(includes Nursemaids' Tunnel & Cemeteries)

3 July Kensal Green Catacombs open

4 July Coleshill WWII Open Day

9 – 12 September Heritage Open Days across UK

11 - 12 September SFES Congress (French Underground Society), Loudun

18 – 19 September London Open House Heritage Weekend

24 - 26 September Hidden Earth

16 - 17 October London Transport Depot Special Open Weekend, Acton

Subterranea Britannica AGM 2010 - MINUTES

17th April 2010 at 10.00am - Imperial College, 180 Queens Gate, London, SW7 2AZ

The meeting was opened by the Chairman, Martin Dixon, who welcomed all those attending – especially new members. He thanked Tim Robinson for arranging an interesting agenda for the Spring Meeting and Brian Hillman for all his work as organiser in previous years.

1. Apologies were received from MC Black, John Burgess, Owen Ward, Ken Geddes, Gavin Coulthard, Bob Clary and Steve Underwood.
2. The motion to adopt the Minutes of the 2009 AGM held at The Royal School of Mines on 18th April 2009 was proposed by Terry Wiseman, seconded by Stewart Wild, and passed by members with one abstention.
3. The Chairman took the opportunity to summarise some of the information contained in the Chairman's Report, which had been circulated in advance of the meeting:
   - Subterranea Britannica celebrated its 35th birthday in 2009, and successfully recruited 1,000 concurrent members for the first time. He added that the membership for 2010 had already reached 940, which was very encouraging. Renewal rates were about 95%, which was very high and demonstrated that members valued what Sub Brit membership offers.
   - He said that last year had been very active, with two days of talks; three issues of *Subterranea*; three committee meetings; two study weekends; many day trips (often organised by members); an active exchange of e-mail messages; and over one million "hits" on the Subterranea Britannica website. The Chairman thanked all those who had been involved in these activities.
4. The Chairman explained that, as a Company limited by guarantee, it was for the Directors to approve the Accounts for the year ended 31st December 2009 (which had been previously circulated), but the committee was keen that members should be kept fully informed.

   Terry Wiseman proposed a formal vote of thanks to Sue Monsell for all her work on the accounts, and Sue then proposed a similar vote for Nick Catford for his work as Membership Secretary. Both were supported by members present.
5. A motion that "nominations for election be considered "en bloc" was proposed by Richard Lamont, seconded by Mike Stace, and passed "*nem con*".
6. A motion to elect the following Officers and Committee for 2010/2011 – Martin Dixon (Chairman); Linda Bartlett (Vice Chairman); Sue Monsell (Treasurer); Roger Starling (Secretary); Nick Catford (Membership Secretary); Paul Sowan (Member); Bob Templeman (Member); Hugh Ainsley (Member); and Andrew Smith (Member) – was passed *"nem con"*.

   Andrew Smith noted that MC Black had decided not to stand for re-election, and proposed a formal vote of thanks to him for his contributions to Subterranea Britannica whilst on the Committee over many years.

The meeting closed at 10.20am

Subterranea Britannica EGM 2010 - MINUTES

17th April 2010 at 10.20am - Imperial College, 180 Queens Gate, London, SW7 2AZ

The proposals to change the Articles of Association, as summarised below, were all duly passed

A: Minimum Age of Directors

Set at 18 years or older

B: Proxies

Introducing voting by proxy

C: Indemnity for Directors and Officers

Allowing for indemnity insurance to be provided should it be required in the future

D: Electronic Communications: E-Mail and Website

Allowing for the use of such communications

E: Accounts

Generally tidying up the wording of the Articles

The meeting closed at 10.35am

NEWS – ARCHAEOLOGY

Cave divers' unexpected discovery in Creevy Cave, Carrickmacross, Co. Monaghan, Republic of Ireland

Two cave divers penetrating, as they thought, a hitherto unexplored cave in County Monaghan found they had been beaten to it by several centuries. To their great surprise, they encountered a passage between neatly executed dry stone walls with a stone slabs ceiling. They had unwittingly found their way into one of Ireland's numerous souterrains, man-made subsurface passages of much-debated date and purpose. Such things are also found in mainland UK, notably in Cornwall and Scotland.

SOURCE: KENNEDY, Alasdair, and Arthur KOZLOWSKI, 2010, A rite of passage. *Descent* 212, 34 – 35.

High Rake lead mine, Peak District, Derbyshire

John Barnatt, who is Senior Survey Archaeologist for the Peak District National Park Authority, has reported on excavations at the site of High Rake lead mine west of the hamlet of Windmill, and south of Little Hucklow.

This was a very short-lived (1834–1853), unsuccessful, but exceptionally well-documented mine – its shareholders lost £12,800 (£ millions in modern terms). Almost all physical trace of it had been lost, following demolition of the upstanding built fabric in 1929 (the secondhand stone was used to build council houses), reworking of the spoil tips for fluorspar, and use of the site as a rubbish tip. Very large quantities of spoil had to be removed to reveal archaeological features. These include the foundations and sub-surface parts of two engine houses (for pumping and ore-winding), evidence for an ore dressing floor and ore crusher, a reservoir, and a coal yard.

Evidence also emerged of an earlier failed mine at the site. In 1834 a pre-existing (eighteenth-century) shaft was deepened to 220 metres, the intention being to work galena from below layers of volcanic rock. Worthwhile workable ore was not found, although some was extracted from veins in the volcanic rock. Features were found relating to the earlier mine, especially a horse-worked winding gin. The shaft, with water now standing at a depth of 98 metres from the surface, is capped by a concrete slab. The sub-surface part of one of the engine-houses survives, and details are given (from documentation and from archaeological evidence) of the engines.

The site has been consolidated and made safe and is publicly accessible from an adjoining footpath, and interpretation boards have been erected.

SOURCE: BARNATT, John, 2010, High Rake lead mine. *Current Archaeology* 20(11)(239), 36 – 41.

Excavations at Chatham Lines, Kent

Excavations by the Canterbury Archaeological Trust have been reported in that body's Annual Report for 2007–2008, in the Lower Lines and Sally Port areas of the Chatham Lines. A number of underground structures associated with the Lines' use for training in siege techniques, and the underground complex of HMS *Wildfire*, are noticed. This area is to be used for a new campus for the Mid-Kent College, and an adjoining Great Lines Heritage Park.

SOURCE: *Casemate* 87 (January 2010), page 12.

World War II sound mirrors, Kent

The World War II large concrete sound mirrors on the Kent coast, from Dungeness to Dover (and on the Isle of Sheppey) have attracted considerable interest from authors in recent years. The latest published description appears in the Folly Fellowship's magazine *Follies*, although it seems to be stretching things a bit to describe the structures as follies. They did work, in detecting incoming enemy aircraft, up to a point. But they were rapidly rendered obsolete by the design of faster aircraft and, of course, the V1 flying bombs and V2 rockets. A good example can be found on the clifftop walk from Folkestone to Dover.

DETAILS: FAIRALL, Alastair, 2010, Sound mirrors. *Follies* 19(4)(75), 6 – 7.

A World War II poster discovered in the Tunnel Road West air-raid shelter, Reigate

Paul W. Sowan

The sharp eyes of a member of the Wealden Cave and Mine Society spotted the following notice on a brick wall in what is now the shooting range of a rifle club in the Tunnel Road West sand mines at Reigate:

> This shelter is not gas proof.
> Always bring your gas mask with you.

This is printed in dark blue ink on deteriorating paper. The mine has had a number of uses since mining ceased probably in or soon after 1858, in which year there was a major roof fall resulting in what is now better known as an attractively planted 'sunken garden' (in reality a mining subsidence feature) in the Castle Grounds above. These have included storage for alcoholic beverages, storage for Army purposes in World War I, an air-raid shelter in World War II and, now, a rifle range. The oldest graffito recorded in the mine is a prominently and carefully carved inscription HAA 1862 which might relate to the mine's owner, operator, or closure date.

The Wealden Cave and Mine Society, with the permission of the Rifle Club, open the TRW mine to the public on four summer Saturdays each year. The remains of the notice are on a west-facing brick wall at the east end of the long east-west gallery just inside the entrance.

A Borough of Reigate plan dating from 1939 shows proposals for conversion for air-raid shelter use, and during WCMS Open Days a number of members of the public have reported that they recall sheltering overnight

at this location. Amongst other relics of World War II vintage are traces of the main and emergency entrance / exit staircases. There are also World War II period dated graffiti on the walls, and a depiction of Adolf Hitler.

Archaeological excavations on Inchkeith, Firth of Forth, Scotland

Members of Subterranea Britannica enjoyed some hours exploring the uninhabited island of Inchkeith, in the Firth of Forth, on 12 September 2004, this being visited during the duration of the Study Weekend that year. Both the island, crammed with Victorian and World War II fortifications, and the very wet and blowy crossing from Newhaven Harbour (near Leith), were memorable.

Inchkeith, part of the Parish of Kinghorn (Fife), lies about 4.5 km south by east from Kinghorn and 5.5 km north by east of Leith (the port for Edinburgh) and thus occupies a strategically important position. It falls mainly within National Grid square NT 2982. The elongated triangular island is aligned approximately north-northwest to south-southeast, and is about 1.2 km long and 0.4 km wide at its widest point. It is dominated by the prominent Lighthouse Ridge, with a maximum height of about 55 metres. The geology is almost exclusively Carboniferous age sedimentary rocks (largely sandstones) interbedded between greater thicknesses of igneous rocks. The springs on the island were once sufficient to constitute a useful supply of fresh water for passing ships.

During August 2001 a team of archaeologists investigated five localities on the island, using mainstream excavation techniques. Their report has now been published, and includes also a very useful summary of the military history of Inchkeith.

During the time of James IV of Scotland [1473–1513], who reigned from 1488, Inchkeith was used as an isolation settlement for plague and syphilis victims. In 1799 the Russians offloaded further plague victims, most of whom are buried on the island.

The earliest fort was built by the English, following the defeat of the Scots at the Battle of Pinkie in 1547. Inchkeith was retaken by a combined Scots and French force in 1549, the garrison at that time being of English and Italian men. It remained in French hands until 1560, but the fort was slighted (deliberately part-demolished to make it inoperable) in 1567. The political union of England and Scotland took place in 1707.

Remains of the first fort were largely obliterated by the erection of the lighthouse in 1803: this was permanently manned until the 1980s, since when it has been automatic.

During the Victorian period the East, South, and West forts were built, from 1861 onwards, the necessary land for these being purchased from the Buccleuch estate. There were extensions in 1878, and the War Office completed the purchase of the whole island in 1879. The works were completed by 1880, the forts having casemates, tunnels, and magazines of 'an almost subterranean character'. During experimental bombardment of the defensive works, from the sea, in 1884 shells bounced off the defensive glacis masonry, as intended.

During World War II Inchkeith was the HQ of the 505th (Forth) Coast Regiment RA, with up to 500 men. Much additional building took place.

As the authors say:

> No reference to the island's role in WWII can go without reference to the notorious events of 21 February 1940, when an Admiralty trawler strayed dangerously close to a minefield. Unable to raise the vessel by radio, the gunners in the southern battery fired a practice round across the boat's bow. Like a skimmed stone, the round bounced on the surface of the water and hurtled on to Leith, where it crashed through the wall of a tenement before coming to rest in a garden shed. Fortunately, no one was injured, and in some re-tellings of what is locally remembered as the 'Battle of Salamander Street,' the projectile was mailed back to the garrison on the island.

After the war, the location was retained until 1953 as a National Service training facility.

The excavation trenches were located as follows:

[1] Base of a rock cut trench on the south side of the Victorian South Fort, at the south end of the island, An unexpected doorway in the outer wall of a caponier was revealed, as was a blocked door.

[2] An almost completely buried sunken concrete structure / battery command post, also near the south end, proved to contain probable demolition debris; and some stencilled signs were revealed on the concrete walls. This structure was found to abut a larger subterranean or semi-subterranean bunker, identified as a telephone room.

[3] Section across a fire trench on a cliff-top on the east coast. Evidence for three phases of trenching was found.

[4] Cut terrace on the east coast. An iron gun mounting was found on a concrete base.

[5] Shell midden on the beach at the northeast of the island. Marine shells and horse bones were found. The midden is reportedly probably of 16th-century date.

The paper contains a very thorough list of published and archival resources.

SOURCE: POLLARD, Tony, and Iain BANKS, 2008, Archaeological investigation of military sites on Inchkeith Island, *Jl. Conflict Archaeology* 4, 109 – 136.

NEWS – CONSERVATION AND HERITAGE

Morwellham Quay (including the George & Charlotte copper mine) for sale, Devon

Morwellham Quay, near Tavistock, was closed as a publicly visitable site in October 2009, as a result of financial problems. The entire site, comprising historic buildings, mining-related structures, and the George & Charlotte copper mine, has been offered for sale. It may, or may not, reopen in 2010 as a tourist attraction. A popular feature under the previous management was a train ride through the copper mine, in the course of which recreated and original mining features and scenes could be viewed.

The Quay was, between 1848 and 1858, England's busiest inland port: but it had been abandoned by the earliest years of the twentieth century. The Quay was connected to Tavistock via the four-mile Tavistock Canal (including a 1 ∫ mile tunnel) completed in 1817.

SOURCE: ANON, 2009, Morwellham Quay for sale. *Descent* 211, page 7.

SOURCE: GOSLING, Roger, 2009, Sad day at Morwellham. *Descent* 211, page 16.

A coal-mining museum at Le Molay Littry, near Bayeux, Normandy, France

If in Normandy, visiting the beaches perhaps, or poking about at World War II era concrete, you may feel like a small diversion to a colliery museum at Le Molay Littry, about 12 km west of Bayeux. Coal mines here exploited a small coalfield during the years 1741 to 1880 and again (initiated by the occupying Germans) from 1941 to 1950. The coal raised was largely used to fire lime kilns in the district.

The Musée de la Mine was opened, oddly, in 1902. Your reporter (PWS) visited in or about 1981, and recalls an interesting array of surface and indoor exhibits, including real and model steam engines, and a, then, laughably amateurish attempt at a simulated sub-surface mine gallery: so many people had poked the 'coal' that the whole thing was all too obviously no more than blackened polystyrene!

In a more recent report, Chris Jones gives the impression that the 'underground' experience is altogether more satisfactory! Worth *seeing*, if in Normandy, but probably not worth *going to see*, unless the mechanical engineering side of coal mining is your passion.

References:

DUPONT, M.M., ND, *Le Molay Littry. Museé de la Mine. Guide du visiteur*. NP: 16pp.

JONES, Chris, 2010, Dead cats and steam engines. *Descent* 212, page 18.

SOWAN, P.W., 1981, Museé de la Mine - Le Molay Littry, Lower Normandy. *Bull. Association for Industrial Archaeology* 8(4), page 3.

Grant boost for old copper mine on Anglesey

Work to turn a former copper mine on Anglesey into a heritage site has been given a £497,000 boost. Amlwch Industrial Heritage Trust's Copper Kingdom project aims to improve visitor facilities, and provide training courses at Parys Mountain. The scheme is one of three heritage projects in Wales to share a £1.2m Heritage Lottery Fund grant.

The Amlwch mines were once the world's most important producers of copper in huge demand by the emerging industries of the early years of the Industrial Revolution.

SOURCE: *BBC News Channel* 23 March 2010

Limestone caverns near Wrexham may open to tourists

There are plans to open up a network of underground caves to the public as part of a bid to transform a Wrexham quarry into a 'significant' tourist attraction.

Photo by Peter Appleton

For over 200 years limestone was mined at Minera Quarry but operations ceased in 1994. Now conservationists want to develop the site for recreation and tourism. A report to Wrexham council's executive board says the site is of "considerable interest" in terms of animal and plant life as well as industrial heritage. It states the council could help by providing advice although it has made it clear it cannot contribute financially.

SOURCE: *BBC News Channel* 9 March 2010

NEWS – HEALTH AND SAFETY

Health & Safety: new investigations concerning the carbon dioxide hazard underground

Normal atmospheric air contains about 0.04% carbon dioxide, whereas exhaled air contains around 5%. Despite the fact that we are constantly breathing this out, the relatively dense gas is seriously dangerous to health and life if it accumulates in any confined space.

The Health & Safety Executive suggests that 0.5% should be the maximum level for an eight hour working day, and 1.5% as the absolute maximum in any work place for any length of time.

Fortunately, the human body responds to higher than desirable concentrations, so potential victims are aware something is wrong. At levels above 1% respiration rate

increases during exertion. Above 2% breathlessness increases and headaches are common. At 3% a person experiences difficulties in breathing, and at 5% disorientation and chesty muscle pains occur. From 7.5% to 10% work becomes impossible and death will occur unless help is immediate.

HSE working limits are often exceeded in underground confined spaces.

The sources of underground carbon dioxide are:

- Exhaled air
- Decomposition of rotting timber or other organic matter
- Plant roots and soil organisms.

Inadequately ventilated, small, dead-end spaces, and the lowest points in tunnel systems, should be treated with particular caution, as should vertical shafts in which carbon dioxide may well be ponded.

SOURCE: NEWPORT, Aubrey, 2009, Bad air in caves. *Descent* 211, page 19.

Fatalities underground 1775 to 2006

There are obvious, and some less than obvious, dangers in exploring underground and confined spaces. Our everyday environment, likewise, presents numerous threats of injury and death. In fact, one is far more likely to be injured or killed in the course of accidents in the home or out in the streets than underground. Nevertheless, anybody who does go underground should study relevant accident reports, and learn what lessons there are to be learned from them.

A survey of 142 recorded subterranean fatalities in mines and natural caves from 1775 to 2006 (excluding working miners) reveals that many of the victims were inappropriately dressed or equipped or experienced; many were over-adventurous children, or careless adults falling down shafts or attempting to rescue dogs that had done so.

Of the 142 deaths, 21 were in underground mines or quarries, rather than natural caves.

Blaenau Ffestiniog slate quarry closes

What was once the world's largest slate quarry has shut because it is in danger of collapsing.

Cracks were spotted in the surface of the historic Oakley Quarry in Blaenau Ffestiniog, and bosses at Welsh Slate decided to shut it immediately to protect workers' safety. It means up to 30 of the site's 55 staff will lose their jobs and another 25 to 30 will be offered jobs at Penrhyn Quarry, Bethesda, which is owned by the same company.

Geologists were called in after significant cracks emerged on the surface of the site in February and were found to be caused by subsidence in mine chambers. Bosses had no option but to mothball the 179-year-old quarry.

SOURCE: *Caernarfon Denbigh Herald* 18 March 2010.

Collapse in Cwmorthin underground slate quarry, North Wales

There has been a collapse of rock in the floor 2 adit at Cwmorthin slate quarry near Blaenau Ffestiniog. This extensive site has six accessible underground floors, some of the very large chambers being partially flooded. The quarry was worked from the early nineteenth century and, on a small scale, on and off into the 1980s. Visit www.cwmorthin.co.uk for further information.

ANON, 2009, Take care in Cwmorthin. *Descent* 211, page 16.

NEWS – MILITARY AND DEFENCE

Kall-Urft atomic shelter, Eifel, Germany

An 'atomic shelter' built in 1962 to accommodate 300 persons for 30 days, but closed in 1993, has now been opened to the public. The shelter is said to be in a very good state of preservation, and an extremely popular visitor attraction.

SOURCE: *Casemate* 87 (January 2010), page 14.

A historic WWII and Cold War bunker at Bentley Priory to be filled in

VSM Estates owns Bentley Priory, in The Common, Stanmore, Middlesex, and is planning to demolish the interior of the historic bunker as it prepares to remarket the site. Workmen will remove the top soil before knocking in the roof and filling the bunker with rubble. The top soil will then be replaced, leaving the exterior of the building still intact.

The move is opposed by the Stanmore Association who say the bunker should be opened to the public. Guy Gusterson, land director at VSM Estates, said: "The bunker on the site will be filled in as part of the development works to make the site safe for public access. English Heritage has decided not to list the bunker and has noted that there are better examples of Cold War bunkers in the UK which should be retained."

The RAF Bentley Priory Battle of Britain Trust backed VSM Estates, saying the cost of maintaining the bunker would be too great. Squadron Leader Erica Ferguson said: "The bunker has never been part of the trust's plans

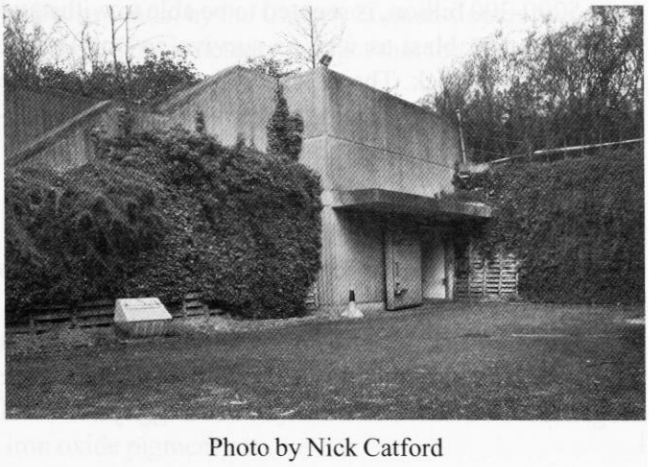


Photo by Nick Catford

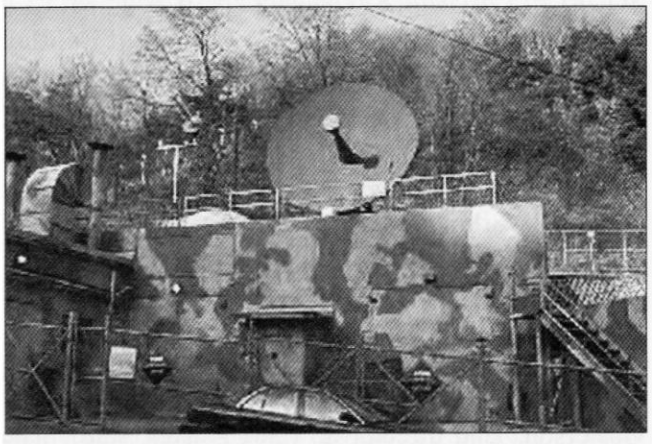
because they just couldn't afford it. The bunker was substantially altered during the 1980s including the flooring over of the WWII two-level operations room.

SOURCE: *Harrow Times* 10 March 2010.

Proposed transfer of key US command bunker to South Korea

The top American military officer in South Korea has proposed that South Korea buy a key U.S. underground command bunker on the outskirts of Seoul, as his troops will move to an area south of the Han River, relinquishing wartime operational control to Korean commanders, a source at the Combined Forces Command (CFC) said in March.

CFC Commander Gen. Walter Sharp, who concurrently heads the 28,000-strong U.S. Forces Korea (USFK), made the proposal to South Korea during the Key Resolve command-post exercise that ended recently. The Ministry of National Defence is reviewing the offer but has yet to make a final decision.



The bunker, known as CP Tango (Command Post Theater, Air, Naval, Ground Operations), is the main command and control centre from which U.S. military leaders would direct any combat against North Korea. Sharp's proposal reflects the firm U.S. intent to shift its roles and missions to air and naval-centric support after the South Korean military takes over operational control of its troops during wartime in 2012 as scheduled, despite calls to delay the transition.

The granite bunker, which is estimated to have cost at least $200-300 billion, is reputed to be able to withstand even a nuclear blast as well as survive any biological and chemical attack. The centre of about 30,000 square metres features up-to-date computer, information-gathering and communications equipment.

SOURCE: *Korea Times* 31 March 2010.

Former Irish Civil Defence HQ sold

Firmount House in Clane, Co Kildare in Ireland has recently been sold complete with its own nuclear bunker.

The former British military hospital and, by the 1940s, a TB sanatorium was transformed into the Civil Defence Regional Control Centre and the County Control

Firmount House

headquarters for counties Kildare and Dublin. The fear among Irish government planners was that in the event of an exchange of nuclear missiles, atomic weapons might impact on Britain and trigger plumes of radioactivity borne on easterly winds across the Irish Sea.

A Civil Defence network was set up and trained by the Dept. of Defence but organised at local level by the county councils. The Kildare Civil Defence comprised volunteers who formed a network of wardens. Their duty was to measure radiation in their localities and phone the readings into the control centre at Firmount where the County Manager and his team of advisers would plot the track of the radiation and, so the plan went, would activate warning and evacuation arrangements for the population.

A warden in the Kildare Civil Defence recalls visiting Firmount during the National Fallout exercises and observing the County Control teams assimilating the information being phoned in by warden volunteers throughout Co. Kildare. He described normally tranquil locations that became hotspots on the map in the simulated fight against nuclear disaster. Local Civil Defence wardens phoned in messages in a coded patter indicating the intensity of radiation in their districts. However unlikely the scenario, the volunteer input was impressive as was the commitment of the County Council and Dept. of Defence staff who brought as much realism as possible to the exercise.

Any impression that Firmount was some kind of high-tech command centre with arrays of radar screens and warning illuminations was quickly dispelled for the visitor – a few blocked-up windows, an old style-telephone exchange, and a kitchen equipped to feed a small army were about the only concessions to its intended role at the heart of the nuclear alert system for the capital and adjoining counties.

Firmount House, built in the 1870s, is one of 71 properties sold by auction in Dublin on April 30.

SOURCE: *Leinster Leader* 14 Jan 2010 & *Irish Times* 8 April 2010

German WWII & Cold War Bunkers for sale

The state of Hesse is selling twenty bunkers from World War II and the Cold War to the highest bidder, the Institute for Federal Real Estate in Germany has announced. The unique real estate is among some 70 bunkers – both above and below ground – for which the government no longer wants to pay the upkeep.

The secure spaces have been deemed unnecessary since the end of the Cold War, spokesperson for the Federal Office of Civil Protection and Disaster Assistance has stated.

"For current population protection scenarios like natural disasters, power outages and terror attacks, the existing structures are of limited suitability due to their technical outfitting and operational capabilities," she said.

The walls of one four-floor bunker, built to hold 4,000 people during World War II near the Marien hospital in Kassel, are damp and covered with mould and cobwebs. The poor state of the bunkers will likely be as much of a challenge to buyers as it has been for the city.

SOURCE: *The Local* – Germany's News in English 5 March 2010

Network of bunkers and tunnels under construction in the Middle East

Iran and its proxies, Hezbollah and Hamas, are building underground tunnel and bunker systems for their war against Israel.

The United States noted the strategic importance of the military complexes when it imposed sanctions Feb 10 on four companies run by Iran's Islamic Revolutionary Guards Corps that specialize in underground engineering projects. Iran is using these firms in its efforts to provide hardened underground complexes for its nuclear facilities, such as the new uranium enrichment centre near the holy city of Qom that is being built inside a mountain.

According to Arab sources, engineers from Khatam al-Anbia helped Syrian technicians build several underground bunker complexes. They also acted as consultants to Hezbollah, which has built an elaborate network of bunker complexes containing missile storage and launching facilities, command and communications centres and linking tunnels in south Lebanon following the 2006 war with Israel.

The difficulties in knocking out Iranian underground targets is causing considerable concern in Israel, which has threatened to mount pre-emptive air strikes – and possibly ballistic missiles as well – in a bid to destroy or cripple Iran's nuclear infrastructure.

SOURCE: Official Wire 10.3.2010

School air-raid shelters at Redhill, Surrey

Jan Spencer has published some new information concerning the air-raid shelters at St John's Schools, Redhill, described in *Subterranea* 20, pp60–62 (2009). The shelter has been further considered in an MA study by Sue Morecroft at the University of York. She suggests that air-raid shelters can be an excellent learning resource for twentyfirst-century children.

A Pathé film of 7 July 1941 in the *Blitz and Pieces* series suggested the boys painted the mural decorations during periods of air-raid alert (http://tinyurl.com/sihg11). However, this is held to be unlikely as the 272 boys in the school at that time would, in the shelter, have left very little room to manoeuvre. Oral evidence from former pupils confirms that the paintings were done as a part of time-tabled art lessons, a single class at a time working in the shelter. Visit also http://tinyurl.com/sihg06 and http://tinyurl.com/sihg14

Fox Photographs are known to have recorded boys working underground on 31 July 1941: these photographs have recently been located.

Sue Morecroft's dissertation for an MA at York, on the archaeology of buildings, is *Defending the future: school air-raid shelters of World War II 1939 – 1945.*

A DVD of St John's School at War, and Alan Moore's history of the school, can be obtained from Gabi Slaughter at St John's School, Pendleton Road, Redhill, Surrey RH1 6QG (telephone: 01737 7703010).

SOURCE: SPENCER, Jan, 2009, Air-raid shelters at St John's School, Redhill. *Newsletter Surrey Industrial History Group* 172, pages 1 and 16 – 17.

NEWS – MINES AND QUARRIES

Access to Pen Recca slate quarry denied, Devon

Access to the small underground Penn Recca slate quarry near Buckfastleigh is currently denied (on health and safety grounds) by the Church Commissioners, who own the land. This is despite the fact that the Bishop of Bath and Wells is a former caver!

SOURCE: CHURCH COMMISSIONERS, 2009, Penn Recca mine access. *Descent* 211, page 17.

Mine reopened on Mendip Hills, Somerset

Cavers hoping to dig their way into an unrecorded cave have instead reopened an old mine in the Draycott Sleights area on the Mendip Hills. About 30 metres of passageway is reported, to a dead end, with shot-holes and a stemple reported. The working has been called 'Minstrel mine' and, it is suggested, may have been for ochre (a natural iron oxide pigment).

SOURCE: GARDINER, Stu, 2009, A new discovery: Minstrel mine. *Descent* 211, page 8.

Mining Company fined for water pollution at Stoney Middleton, Peak District

Glebe Mines Ltd, operators of the Cavendish Mill at Stoney Middleton, Derbyshire, pleaded guilty on 12 March 2009 at Chesterfield Magistrates Court to two charges of polluting watercourses (sources of drinking water) in January and August 2007. The company was fined £22,000, and ordered to pay £16,397.16 in costs.

The firm caused 'a thick wave of mud' to flow through Stoney Middleton, a small village, leading to 'devastating pollution' of Peak District waters – the Stoke Brook and the River Derwent, and watercourses downstream. The charges were brought by the Environment Agency under the Water Resources Act, 1991. For details see www.environment-agency.gov.uk/news/105312,aspx

SOURCE: ANON, 2009, Glebe Mines Ltd. *Newsletter Northern Mine Research Society*, November 2009, page 11.

NEWS – MISCELLANEOUS

Collapse of the roof of Nero's subterranean palace near the Colosseum in Rome

Part of the ceiling over the palace of the Roman emperor Nero has collapsed in Rome, prompting fresh concerns over the stability of the ancient complex.

The damaged section at the Domus Aurea (House of Gold) complex was about 60 sq m, officials say. No one was injured. This was one of the biggest collapses at the monument in the past 50 years; officials believe it was caused by water damage

The palace was lost for several hundred years until a hapless peasant fell through the roof in the late eighteenth century and rediscovered the tunnels. This palace is said to feature Nero's famous rotating dining room, a contemporary feat of engineering where the floor of the room was carried on large spheres in a ring gulley which were driven by water power.

SOURCE: *BBC News* 30 March 2010.

Possible clandestine Catholic chapel found in Shropshire

A Shropshire family moved into the detached Victorian house in 2007 and they have always wondered what was below the metre-long rectangle grille which lay alongside a wall. After three years they eventually decided to lift the grille and squeezed through into a cellar.

The cellar resembles a chapel, with what appear to be pews which may have been used by a congregation fleeing persecution. In the centre of the room there is a wooden cross which seems to have fallen down after rotting away. In the middle of the basement there is an old, open chest and in it some old newspapers and bottles dating back to the 1930s.

The deeds show the detached house is 230 years ago and the present owner believes that at some point it had been used as a pub.

A local expert said there's a chance the cellar could have been used as a Catholic hideaway or for other nonconformist religious groups "There's a possibility a room like that could be used as a clandestine Catholic church as at that time Catholics were often persecuted and could even be executed." There is also speculation that it could have been used by the Home Guard during WW2.

SOURCE: Mail on Line 7 April 2010

Man moves mountain to park truck, northeast India

An Indian villager used a hammer and chisel over the span of 14 years to carve a tunnel through a rocky mountain so that he could park his truck in front of his house.

"I could not park my truck near my house since the mountain blocked my path," Ramchandra Das, who lives in eastern Bihar state's Gaya district, said. Mr Das said fear of thieves stealing his truck prompted him to work on the tunnel all by himself after authorities refused help.

"I had to leave my truck miles away, so I decided to do something about it myself," he said. Local villagers, who had to trek for miles to get around the mountain, are using the 14ft wide tunnel to reach their farms, and praising Mr Das for his work.

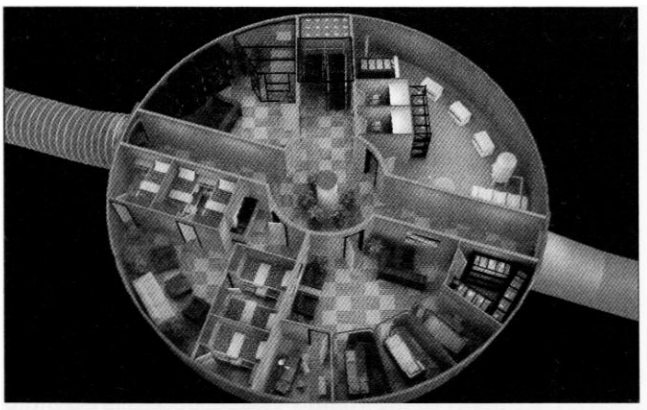
"We rarely come across a man who can work so hard to achieve his goal," Prabhat Kumar Jha, a local government official, said.

SOURCE: Reuters, 1 December 2009

California company to build 20 mass shelters

The California-based company Vivos plans to build a network of 20 shelters near most major cities of the US. Each 20,000-square-foot shelter, which can hold up to 200 people, would be located about five storeys underground with walls two to three feet thick. The shelters would be stocked with a year's supply of "gourmet foods," as well as medical and dental centres.

Each shelter costs about $10 million to build, and Vivos is selling space in the price range of about $50,000 per



person. So far, about 1,000 applications have been received for space in the shelters.

According to Vivos the shelters can withstand almost any global disaster including nuclear attacks, bio-terrorism, chemical warfare, super volcano eruptions, asteroids, solar flares, tsunamis, earthquakes, pole shifts, the return of Planet X, social and political anarchy; all of which, the company claims, "have the potential to wipe out humanity but could be survived by living in a Vivos shelter."

Each shelter will also become a DNA depository. Universities are invited to submit DNA samples of every living thing on Earth, along with seeds, which will be stored in refrigerated vaults. As Vivos' website explains, "This will assure the greatest chance of future restoration of the world as we know it, regardless of the catastrophe." The vaults will also contain off-road vehicles and hunting and fishing equipment for when returning to the surface.

See Vivos web site http://www.terravivos.com/

SOURCE: Physorg.com, 12 April 2010

Massive sink-hole appears in a Grays (Essex) garden

A father-of-two has narrowly avoided being sucked into a massive sink-hole which formed a 25ft-deep crater in his backyard just seconds after he walked across it. Electrician Ben Luck lived up to his name after the crater, measuring 20ft wide, swallowed up most of his patio just as he went inside his house.

He told a reporter, "I had been gardening and my wife called me inside for lunch and I walked across the patio. If I had been there at the time I would have died, there wouldn't have been any trace of me. I feel very lucky, luck by name, luck by nature I suppose."

Photo from Peter Lawson Eastnews Press Agency

The couple and their children immediately fled their house and have since had to move into a hotel. "I was terrified, I was shaking. I told my wife to run. I was worried the house would fall into it, I still am," Mr Luck said.

The family from Grays in Essex have now been moved into a hotel. Structural engineers have told them they can't return to their home until there is no risk the house will cave in. The massive crater has increased in size since it was first exposed and has been sealed off with metal safety railings.

SOURCE: *Mail Online,* 14 April 2010.

NEWS PUBLICATIONS – BOOKS AND MONOGRAPH REVIEWS

The East Kent Light Railway

DETAILS: FINCH, Maurice Lawson, and Stephen R. GARRETT, 2003, *The East Kent Light Railway*. Usk: Oakwood Press: two volumes [1–232 and 233–472pp] [ISBN 0-85361-608-6 and 0-85361-609-4] £14.95 for each volume.

The title of this substantial two-volume work might at first glance suggest an exhaustive account of the minutiae of an inconsequential light railway. It is, however, rather more than that. No account of the East Kent Light Railway could be considered adequate without an explanation of its economic context. As a railway, the EKLR had no notable civil engineering works other than the curious half-tunnel under Golgotha hill between Shepherdswell and Eythorne. It had minimal 'bus shelter' style stations, largely secondhand rolling stock, and various made or planned branches many of which, if built, sometimes went nowhere in particular.

It all made sense, or at least it all seemed a good idea at the time, in the context of the as-it-happens unfulfilled promise of the East Kent collieries (only four of which ever produced coal on a commercial scale), the failed port at Richborough, other railways competing for traffic, and the export potential of Dover Harbour.

The metalliferous mines of Cartmel and South Lonsdale, Lancashire

DETAILS: MOSELEY, Max, 2010, The metalliferous mines of Cartmel and South Lonsdale. *British Mining [Monograph Northern Mine Research Society]* 89: 105pp [ISBN 978-0-901450-66-1]

This detailed monograph deals with small, shallow mines, almost exclusively for ironstone (for smelting to iron) and associated iron-based mineral pigments in an area of Lancashire to the north and northeast of Morecambe Bay, eastwards of Millom. Small quantities of copper were also worked here, not very successfully, and there were even less rewarding trials for manganese, lead and gold. There is patchy evidence for mining from the twelfth century onwards, and commercial extraction ended in

1894. The larger and more productive ironstone orefield at Furness, to the west, was of greater economic significance.

The geology of the district is described in some detail: the ores occur in solution cavities in the Carboniferous limestone. Haematite was mined down to depths of the order of 30 metres.

A catalogue of sites is included, the more notable mines being the Crag Foot, Warton Crag, and Silverdale workings. There is a sketch geological map: a more detailed topographical map would have improved the accessibility of the monograph. Black-and-white photographs are mainly of often quite striking surface remains, with just a couple of underground views, and several plans and sections of small sections of underground workings. The work concludes with a six-page index.

Underground England

DETAILS: SMITH, Stephen R., 2009, *Underground England: travels beneath our cities and countryside.* London: Little, Brown Book Group: (8) + 306pp [ISBN 978-1-4087-0056-3]

Stephen Smith is a journalist who in recent years has turned his thoughts to places subterranean (his other books deal with Colombia and Cuba). *Underground England* follows on from his earlier *Underground London*, which featured Sub Brit members in a not altogether sympathetic manner.

As he makes clear, these books are not for the experienced or knowledgeable underground enthusiast. They aim to convey to the general reader something of the varieties of underground landscapes, and the experiences of exploring them. This is done entirely through the printed word: he does not include illustrations, of which of course many thousands can now be found on the web.

The books are written with periphrastic circumlocution and a verbosity tending towards grandiloquence. Subterranea Britannica is referenced only once in this latest text and appears in the index as 'caving enthusiasts'. An indication, perhaps, of the depth of research which seems to have been mainly carried out using a thesaurus.

Secret Places, Hidden Sanctuaries

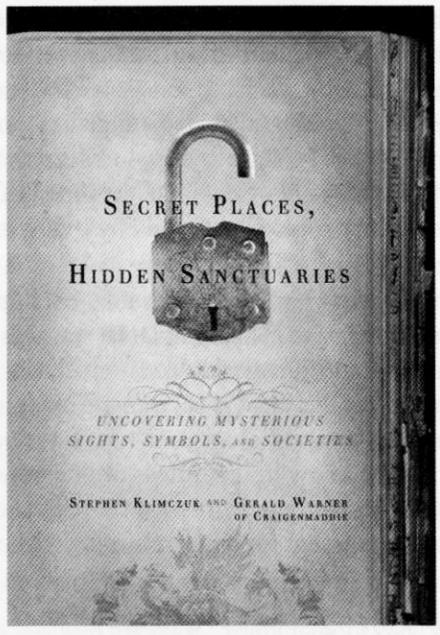
by Stephen Klimczuk and Gerald Warner

Sterling hardback £15 (less from Amazon).

There must be something worrying buried deep in the human psyche given our apparent need to project the wildly improbable upon the blank canvas of what is concealed from view. *Secret Places, Hidden Sanctuaries* provides an overdue corrective to the frame of mind that conjures up Strategic Reserves and UFO bunkers: it goes through conspiracy theories with all the rigour of a French enema administered to an English patient.

Secret Places is written by two intellectual tough guys, one a Goldman Sachs alumnus currently a visiting fellow at Oxford, the other an acerbic *Daily Telegraph* columnist once described as "notoriously moderate". The surprising thing is that after comprehensively demolishing such intellectually dishonest fabrications as *The Da Vinci Code,* the authors go on to shed light upon genuine mysteries of superior interest.

Not a few of these sites are underground, including the promising-sounding Cavern of the Beati Paoli, a black-robed and hooded secret society of assassins in Palermo, Sicily. Like many of the venues visited, access is possible for the persistent and the brave, and one or other of the authors has clearly visited virtually all of those mentioned.



Visiting in this context is not invariably synonymous with ingress, however, as I discovered for myself when investigating the possible home of the Ark of the Covenant (for, improbably, the *Financial Times*) in Axum, Ethiopia. Only the Guardian, a monk selected for his purity, may enter the presence of the Ark without being struck down with immediate and hideous affliction. Successive Guardians have themselves all gone blind eventually. The authors wisely content themselves with the well-guarded exterior view of the Chapel of the Ark.

The jewel in the authors' sinister crown is surely Wewelsburg Castle in Westphalia, the "Satanic Vatican" prepared by Himmler as headquarters for his "knightly order" of the SS. Even their description of the site, rather nervously preserved by the German authorities, is enough to make the skin creep. Other hidden sanctuaries described from the inside which may exert a more current influence are the "tombs" of the secret societies still found at the heart of American Ivy League universities.

The membership of Yale's notorious *Skull & Bones* – for it is almost never surrendered – includes a roll-call of the American great and bad not excluding George W Bush and his presidential opponent Senator John Kerry. On their declaration of charitable aims to the Internal

Revenue Service – for these secret societies actually generate tax rebates for donors – the Bonesmen cited "Sensitivity training" as a primary goal. A likely story given that the induction ritual involves giving a dramatised account of the candidate's sexual history. One shudders to think what the Bush confessional might have entailed.

The book is studded with unlikely but authenticated arcana including the maintenance well into the second half of the twentieth century of Canada's Defence Plan No. 1 – against invasion by the United States. As might be expected, suitably sceptical tours are conducted of Area 51, where they encounter a patrol of the notoriously over-armed "Cammo Dudes" in mirrored shades and Humvees. Another target is the Federal Relocation Arc. While visitors to Mount Weather are also likely to be welcomed with a show of force that would not have been out of place in the Wild West, the former congressional bunker under *The Greenbrier* hotel in West Virginia is open to visits by guests at the golf resort, and irregularly to the public as a number of Sub-Brit members can attest.

The authors have not been content to confine themselves to such well-trodden paths, however, and the intellectual rigour of the academic and investigative skills of the newspaperman have been deployed to dig a little deeper in most cases examined.

Who knew for instance that duels are still routinely fought behind closed doors by uniformed members of the German universities' secretive "corps"? Wagner and even Karl Marx were members. Bismarck fought no fewer than 32 duels in one summer term. Today's corps members continue to fight, the loser's cheeks bearing the scars of honour in perpetuity, and still meet in the ruined castle of Rudelsburg. More importantly, the corps foster a network of friendships every bit as influential as the Ivy League secret societies, and likely more so than most Masonic organisations, another subject entertainingly debunked herein.

Fortunately we can afford to believe virtually all of what we read here, and a great deal more interesting it is than the pitiful fantasies of the pseudo-occultists. While there are locations such as the NSA base at RAF Menwith Hill where the authors are clearly exercising a degree of discretion, the book serves as a much needed antidote to the cult of conspiracy. The truth is out there – and it is a lot more interesting.

Reviewed by Julian Allason

NEWS – TUNNELS AND TUNNELLING

A bad night in the Channel Tunnel

Paul W. Sowan

The night of Friday / Saturday, 18 – 19 December 2009 will long be remembered, by would-be travellers and by those in charge of the Eurostar passenger services through the Channel Tunnel, for the failure inside the tunnel of five London-bound trains, blocking both north and south running tunnels. Obviously, car shuttles and freight trains to and from France were also unable to complete their journeys.

The journeys of over 3,000 London-bound passengers were affected, to which should be added those (unreported) of people trying to get to London on the last three trains that night, which appear never to have reached the tunnel. Not to mention numbers of persons with vehicles on the car / lorry shuttle services.

Both the tunnel (two parallel running-tunnel bores, with a road vehicle emergency services and escape tunnel between them) and the passenger trains are designed, especially as modified after two tunnel fires, to make the removal of a train in trouble a simple matter.

Trains can be routed in either direction in the north and south running tunnels. And they can change from one track to the other at four points (including the undersea English and French crossover caverns) between Folkestone and Sangatte. Thus, it should be a simple matter to route traffic around an immobilised train. Additionally the trains themselves have duplicated power cars and controls, and are equipped to be able to exit from the tunnel with most of that gear out of order. And in two parts, if need be. Finally, there are diesel-electric locomotives on stand-by in case a Eurostar (or a car shuttle) has to be hauled out.

So what actually happened to the five trains?

Train	Origin	Departed	Failed at	Location of failure	Due at London St Pancras	Pass.	What happenedNext?
9157	BRU	18.59	20.56	South running tunnel, English end	19.56	679	Hauled out / hauled to London by tunnel rescue locomotives
9053	PAR	18.43	22.28	South running tunnel, central section	20.06	700	Passengers evacuated via service tunnel
9057	MLV	19.37	23.10	South running tunnel, central section	21.12	664	Passengers evacuated via service tunnel
9055	PAR	19.13	00.51	North running tunnel, central section	20.34	639	Hauled out
9059	BRU	20.29	00.55	North running tunnel, central section	21.33	630	Hauled out

Notes: BRU = Brussels / PAR = Paris / MLV = Marne-la-Vallée (Disneyland Paris)

It is unfortunate (except for the 679 passengers on board) that the stand-by locomotives used to haul out the first failed Eurostar then took it all the way to London, whereas those travelling could have been transferred to London-bound trains at Ashford. But nobody was to know, when the decision was made, that another four trains would have to be hauled out of the tunnel later the same evening or early the next morning. Not to mention the fact that the stand-by locomotives have not been 'cleared' to enter the platforms at Ashford!

When the second and third train failures occurred in the central section of the south running tunnel, two more London-bound services were routed round them, but they too stalled in the central section of the north running tunnel. That put a stop to any more traffic of any kind between England and France that night.

By the time all failed trains had been hauled out to fresh air, a few services ran on 19 December, but a sixth London-bound Eurostar failed in Kent, and all services were suspended until the 22nd. Another train failed in the tunnel on 7 January 2010, but there was a return to a near-normal service by the 12th.

An official investigation severely criticised Eurostar (operator of the passenger trains) and Eurotunnel (operator of the Channel Tunnel) for their lack of preparedness in advance for such a situation, and for their unsatisfactory performance in responding to it. It was estimated that 100,000 persons altogether were stranded or severely delayed. Compensation of the order of £10m is being paid to them.

The cause of the breakdowns was found to be short-circuiting of electrical and/or electronic components by melted snow mixed with metallic dust (presumably from train brakes) taken in through the cooling-air intakes. More technical detail on the cause of the failures appeared in the March edition of *Modern Railways*.

SOURCE: ANON, 2010, Eurostar crisis as trains fail in the Channel Tunnel. *Modern Railways* 67(737), page 8.

SOURCE: DAVIES, Caroline, 2010, 'This was the worst train you could imagine' – report tells of scenes on Eurostar 6057. *The Guardian*, 13 February 2010, page 3.

SOURCE: FORD, Roger, 2010, Eurostar – what price redundancy? *Modern Railways* 67(737), 24 - 26.

A new London tube map, and 'All change', but not at Edgware Road: one last trip round the Circle Line

Paul W. Sowan

On and from Sunday 13 December 2009, Circle Line trains no longer go round and round, half of them clockwise, the other half anticlockwise. No longer will old gaffers on their Freedom Passes be able to spend all day in a cosy tube train carriage, orbiting central London about once every hour.

What Transport for London has chosen to call 'The new extended Circle Line' came into effect with the first trains that Sunday morning. The new arrangement is that trains will start from Hammersmith (Hammersmith & City Line platforms) and run via Paddington, Edgware Road, and all the way round the Circle via Victoria and High Street Kensington, and back through Paddington to terminate at Edgware Road, where they have passed through about an hour before. Then all the way back to Hammersmith, the same way in reverse.

On Saturday 7 December your reporter decided to take one last ride round the Circle. Leaving Victoria at 19.31, he went clockwise, halting briefly just beyond Gloucester Road awaiting signal clearance to take the curve (one of the few very short bits of track the Circle has the exclusive use of) round to High Street Kensington. All was going well, with no further delays, the on-train destination announcements advancing as we passed such places as King's Cross St Pancras (at 19.58).

But a rude awakening was to come: 'All change'! The train was now to terminate at Aldgate at 20.08. It was, we were told, being taken out of service. There would be another Circle Line train in about eight minutes. This duly arrived at 20.20, so the journey back to Victoria was resumed. From Aldgate to Tower Hill is the Circle Line's other bit of exclusive track. On through Blackfriars, temporarily closed for building works including the mainline station above. We arrived back at Victoria at 20.37 having taken 66 minutes for the circuit – including 12 minutes on platform 1 at Aldgate.

To do this on and after 13 December, it will be necessary to change at Edgware Road – fortunately a cross-platform change, so no clambering up and down steps will be called for. This will no doubt be irritating to passengers from Kensington to King's Cross! The advantages of the 'Mug-handle', as the new routing has been dubbed, are claimed to be more reliable services, fewer delays, and more trains to Hammersmith.

A new published account of the Kingsway tram subway, London

Paul W. Sowan

Amongst your reviewer's childhood memories is a ride on a tram through London's tram subway, which allowed double-deck trams from Kingsway to dive under Aldwych and emerge on the Thames Embankment underneath Waterloo Bridge.

What is left of the subway (the southern end was converted for use as a road tunnel opened to traffic in 1961) is Listed Grade II. The 1 in 10 ramp and tunnel entrance in Kingsway, surrounded by its original railings, is easily seen. The south portal on the Embankment has been turned into a modern lounge bar.

E.M.H. Humphreys' account includes a thorough description of the pre-history of the subway, which was (eventually) to allow a physical connection between tramway routes north and south of the Thames. It was a

part of the Kingsway – Aldwych development which replaced a run-down area, leading to 3,700 persons being rehoused on new LCC estates.

The subway was authorised by the LCC Subway & Tramways Act, 1902, and opened in stages between 1906 and 1908. At first only single-deck trams could be accommodated, but on 3 February 1930 the tunnel was closed, and its floor lowered by five feet, allowing double-deck trams to operate on reopening on 14 January 1931.

In 1933, following the formation of the London Passenger Transport Board, a decision was taken to phase out trams and replace them with trolleybuses. This replacement programme was of course delayed by World War II, and closure did not come until July 1952. Of three intended tram stops within the tunnel, only two were built, with island platforms: that for Great Queen Street was renamed Holborn and (briefly) Kingsway (Holborn); the other was at Aldwych. I was quite surprised, as a child, to find tramstops underground! The author gives considerable detail of the several tram routes through the tunnel, and their connections with the north and south networks. He notices, also, post-closure uses for the tunnel, including use as a film set, and for storing buses.

SOURCE: HUMPHREYS, E.M.H., 2008, 100 years of the Kingsway Tram Subway. *Camden History Review* 32, 30–33.

Modernising the Underground, London

The September 2009 issue of *Modern Railways* includes a 'London Underground Special' section, which highlights new trains for the Metropolitan Line, a new service route pattern for the Circle Line (see above), and the reopening of a former rail link from the Metropolitan Line's Watford branch to the Croxley Green branch (closed in 1996). This would allow trains to run through from Watford Junction, and Watford High Street Station to Croxley, with a refurbished station at Watford West, and a new interchange station at Ascot Road. The small length of the Metropolitan Line to its Watford terminus would be closed.

SOURCE: WABOSO, David, *et al.*, 2009, Modernising the London Underground. *Modern Railways* 66(732), 47–60.

A modern private tunnel in west London

When Sol Campbell (a footballer) bought an eight-bedroom townhouse near the river in west London from the actor Minnie Driver's mother for £5.4m, he wasn't entirely satisfied with its facilities. So he built a 40ft tunnel to link the main property to the basement of a two-storey mews house, and his 30ft long swimming pool.

SOURCE: TOPPING, Alexandra, 2009, Big-money moves: the footballer school of architecture. *The Guardian*, 30 December 2009, page 3.

Underground extensions to Dublin Area Rapid Transit, Republic of Ireland

Dublin has an assortment of rail systems which commenced with a terminus (Heuston) on the line from Cork and Limerick, and another mainline station (Connolly) on the line from Belfast (NI) to Wexford. These lines have been supplemented, for urban and suburban traffic, by the Dublin Area Rapid Transit (DART) and the LUAS light railway networks.

Transit across the city centre is now to be provided with a west-east DART extension, commencing at a new station at Inchicore, and a subterranean line running along south of the River Liffey via subsurface interchanges at Heuston and Pearce to Docklands on the north bank of the river. There will also be new subsurface stations at Christchurch and St Stephen's Green. Completion of these new works under the city is expected in 2015.

SOURCE: ABBOTT, James, 2009, Irish investment holding steady. *Modern Railways* 66(732), 62–67.

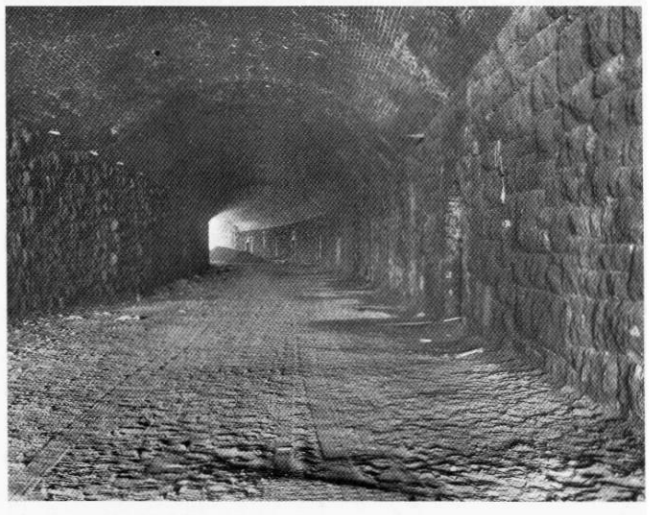
Redundant railway tunnel in Caernarfon provides new home for endangered bats

Bats are to be given a new home in a redundant railway tunnel on a cycle track in Caernarfon.

It is hoped that their new home, created by Gwynedd Council by blocking off a tunnel on the Lôn Eifion cycle track, will also cut anti-social behaviour. Gwynedd is an important area for the lesser horseshoe bats which have become extinct in parts of Britain. It is hoped that the old tunnel will be an ideal roost for the lesser horseshoe bats and a place for bats generally to hibernate.

Mark Balaam, Gwynedd Council's senior countryside warden, said the tunnel would be blocked off, with a bat grille at one end. "This will create a clean and safe habitat and we hope it will become a permanent roost for bats," he said. "The tunnel is ideally situated near feeding sites and we are optimistic that this will help develop an already rich ecosystem," he added.

SOURCE: *BBC News Channel* 20 April 2010



Some Comments on UK Shelter Policy in WWII

Robin Woolven

The previous article *(Subterranea 20,* September 2009*)* briefly described the evolution of *Air Raid Shelter Policy* and mentioned the 1939 Home Office White Paper with that title[1] and the rejection of deep shelters by the 1939 report of Lord Hailey's Conference.[2]

With all the benefits of hindsight this article briefly comments on aspects of the implementation of the UK Government's policy and considers the validity of some of Lord Hailey's warnings on the potential problems of deep shelters that were occasionally seen when other structures were used as deep shelters. Finally, the extent to which all types of shelter were actually used by Londoners is quoted.

The political sensitivity of UK shelter policy was stressed as was the fact that shelter provision was a far from simple matter, so this brief article cannot attempt an assessment of shelter policy and its implementation; rather it is merely a set of comments on Second World War shelters and the main criticisms made of them and the policy behind them. The major criticisms levelled by some of the 'experts', some politicians and many of the public were, of course, that the shelters provided were 'too little and too late' and that the degree of protection provided by the widely distributed 'blast-proof' Anderson and surface brick shelters was inadequate. Each of these points will be discussed using examples that will be familiar to members of this society.

Lateness of Provision?

Before 1935, UK governments were reluctant to announce any move towards rearming the nation only a decade after the end of the Great War. But in November 1932, Stanley Baldwin had warned Parliament that 'the bomber will always get through,'[3] adding that he 'would not pretend we are not taking any precautions in this country.' Those preparations were mostly on paper and kept within Whitehall as the public would not entertain rearmament. The Government lost the 1933 Fulham East by-election mainly 'on no issue but the pacifist'. Baldwin later explained why he had not pressed for rearmament in winning the 1935 General Election:

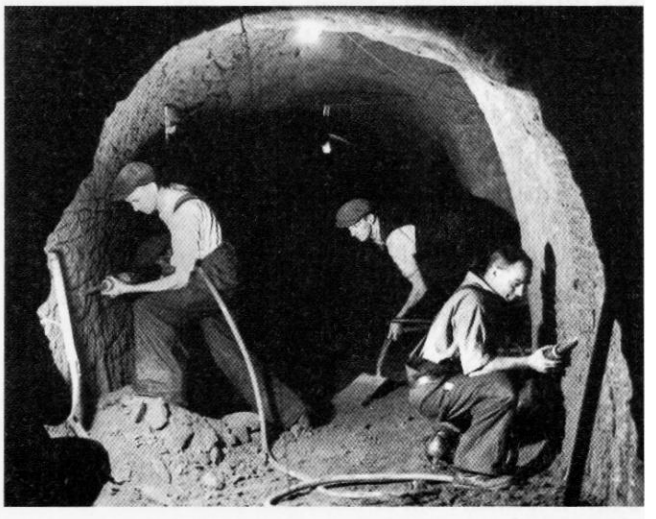
> "... supposing that I had gone to the country and said that Germany was rearming, and that we must rearm, does anyone think that this pacific democracy would have rallied to that cry at that moment? I cannot think of anything that would have made the loss of the election from my point more certain.[4]"

Meanwhile newsreels and the press showed the effects of aerial bombing on civilians in the Sino-Japanese conflict (from 1931), the Italian invasion of Abyssinia (1935-36) and then later through the Spanish Civil War (1936-39). Once the mood changed, in July 1935, the newly established Air Raid Precautions [ARP] Department of the Home Office invited local authorities to prepare their ARP Schemes. But by this time there were huge demands on manpower and resources and the Government announced that citizens themselves were to be responsible for preparing their own gas refuges – gas-proof shelters within the home.

Steel and concrete could be put to a more immediate use in rearmament than constructing air-raid shelters, particularly expensive deep shelters which would also have required skilled manpower. Certainly construction of universal bomb-proof shelters across the country was plainly impossible and shelters were not accepted as necessary until the late September 1938 'Munich' crisis which proved the turning-point in the public realisation that war was imminent and shelter essential. Trench shelters were excavated in public squares and parks during the crisis and local authorities provided strutting to strengthen basements below suitable houses and commercial properties.

In November 1938, Sir John Anderson was appointed the minister responsible for hastening ARP nationally. The government welcomed the experts' report[1] approving the use of the sectional steel 'Anderson' shelters and the manufacture and distribution of these shelters was made a priority. The steel sheets were delivered by the railway companies and could be erected, free of charge, by local authorities. By April 1939 some 300,000 Andersons had been delivered, thus providing protection for 1° million people.

Meanwhile local authorities were building brick surface shelters with reinforced concrete flat roofs, generally in the streets, for residents of blocks of flats and those citizens whose homes could not accommodate a semi-submerged Anderson in their gardens. As tension increased, on 10 May 1939 Anderson asked local authorities to 'so arrange their business that during the



Stockport deep shelters under construction in 1939

next three months priority is given to civil defence matters over all other business before them, and to ensure that all responsible officers of the Authorities are instructed accordingly'.

Thus shelter construction was rather late in starting and, when it did, materials and labour were in short supply due to other defence requirements. Also, large shelters took time to build – when, in October 1940 at the height of the blitz, the Cabinet approved the plan to excavate a series of deep shelters under selected Tube stations, they took some two years to construct so, if such a project was to have been ready for the opening blitz in September 1940, the work would have to have been started long before the Munich crisis, long before such measures would have been acceptable to public opinion.

Adequacy and Use of the Shelters Provided

Lord Hailey's Conference discounted the view

> ... that citizens provided with public shelters, however strongly protected these shelters may be, are thereby made completely safe. We must indeed record our conviction that a universal provision of strongly protected public shelters would be far from making the community 100 percent safe... But we believe that most British citizens would prefer to count upon a less effective protection at their homes, even though this may make no pretence of warding off direct or near hits of bombs, if they can be safeguarded against the one danger which must loom largest in their minds, namely that of being themselves, or seeing their families, buried under fallen roofs or masonry. We believe that if they pause to reflect that on occasion they may fail to hear the warning signal, and that the first indication of a raid in progress may be the dropping of bombs within earshot, the advantages of having some shelter close at hand will be still more apparent to them.

There remained a strong public demand for better shelters than the 'blast-proof' Anderson shelters in gardens and the surface brick shelters in the streets. In use under bombardment the vast majority of these blast-proof shelters protected their occupants but there were many cases of shelter occupants losing their lives from a direct or very near hit. Reporting on the first three months of the V1 offensive in 1944, Sir Ernest Gowers, the Senior Regional Commissioner for London, stated that "all the orthodox forms of shelter afford excellent protection".[5]

Shelterers at Bounds Green Station

The basic arguments for heavily protected (bomb-proof) shelters and the likelihood of a better degree of safety being provided by those various forms of deep shelter proposed by 1939, particularly the Finsbury scheme, were carefully considered by the Hailey Conference.

Lord Hailey's Conference Concerns on Deep Shelters

Hailey's committee of experts examined the problems of air-raid shelters and the possible solutions to the demands of those seeking shelter but warned that:

> ... a widely extended provision of heavy protection might involve dangers such as those of creating a shelter mentality, of interrupting the processes of essential production, or of unduly diverting national effort from other measures of defence. No one of these need be decisive in itself, but, taken in combination, they must be an important element in the determination of policy. ... [but] the problem of shelters cannot be regarded in the light of a contest between a deep shelter policy and a shallow shelter policy...

The concern of interfering with war production if the population remained underground was eventually avoided by providing shelters for workers close to their work so that, rather than take shelter on the alert being sounded, work continued until suitably positioned 'roof spotters' sounded the alarm and the workers then took cover. Also some essential war work was established in underground structures familiar to readers and well described by Nick McCamley.[6]

Morale and 'Shelter Mentality'

Before dismissing the 'shelter mentality' fear it should be realised that the primary aim of Air Raid Precautions, as reported to the Committee of Imperial Defence in 1937, was to maintain morale.[7] Hailey's concern was that those taking refuge below ground might refuse to surface after the raid had passed. Those seeking a night's rest in London Transport's Tube tunnels were moved out each morning to enable the cleaning teams to sweep through the stations as traffic got underway, but in the Ramsgate caves there was a classic example reported by Wing Commander E J (later Sir John) Hodsoll, Inspector General of Civil Defence, in February 1941.

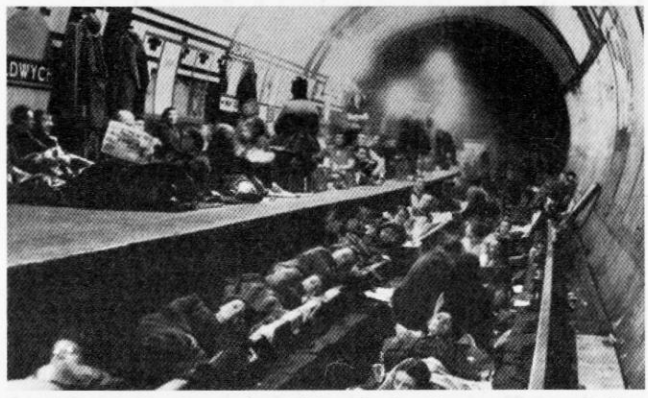
Sir Auckland Geddes, Regional Commissioner for the South East Region, had expressed concern regarding the morale of shelterers in the caves at Ramsgate. Hodsoll visited and reported that:

> Ramsgate possesses tunnel shelter mostly at the depth of some 60 feet, for approximately 60,000 persons – the actual population of Ramsgate at the present moment is in the region of 14,000. There are two lots of tunnel shelters, the largest system being chalk tunnels stretching something like 3° miles and going, I believe, right around the town. The tunnel shelter is in a disused tunnel which was once a miniature railway which ran from the top of the town to the harbour. Most of the rails are still there and the tunnel for most of its length is very nearly full size. I think that part of it was an old full-size railway tunnel which was subsequently given up.
>
> In the tunnel there is what I can only describe as the equivalent of a gipsy squatters camp. On both sides families have screened off for themselves their pitch, the screening consisting of any old blanket, piece of curtain or other material which they could find. Each pitch is completely screened round except for the top, and inside are beds of all sorts and descriptions, bits of furniture and oil cooking stoves. There are several hundred people living permanently in these places, many of whom, as far as we could gather, never leave the tunnel by day or night. Many of them have had their homes destroyed, some have had them damaged, but for whatever reason they just camp out down there with their children, and it is quite clear that many of them have not seen the light of day for several weeks. The children have no arrangements for schooling and no amenities of any sort, except such as can be found by playing in the tunnel.
>
> It would appear that the morale of these people is almost non-existent. Since a considerable amount of cooking on oil stoves is done the smell and the general atmosphere becomes pretty nasty at times.
>
> A party of alleged shelterers greeted the Minister at the entrance to the tunnel shelter with loud cheers, but we subsequently discovered that they had been imported and did not in fact belong to the tunnel at all.
>
> The whole business was most depressing and the Commissioner is rather afraid that the morale of the tunnel squatters is affecting other members of the population, and I should think that might be quite possible. In any case it is a shocking state of affairs to have a considerable body of people leading this sub-human existence. We saw the Mayor of Margate for a few moments. He held quite different views and was very anxious that his population should be got away altogether, feeling that this was right. He did not want his people to go to ground in the same way as at Ramsgate. [8]

Hodsoll later explained:

> Geddes was afraid their sub-human existence would affect the morale of the town and, with the assistance of the Regional Commissioner and with [Minister of Home Security and Home Secretary] Herbert Morrison's full support, these creatures (who had lost morale and manhood) were winkled out.[9]

Although there are few reports of panic during the war[10] the primary case quoted (and perhaps the only officially reported example) is that in Mr Laurence Dunne's report[11] on the March 1943 Bethnal Green shelter disaster. Dunne's final paragraph stated that 'This disaster was caused by a number of people losing their self-control at a particular place and time' and he added 'No forethought in the matter of structural design can be any real safeguard against the effects of the loss of self-control by a crowd'.

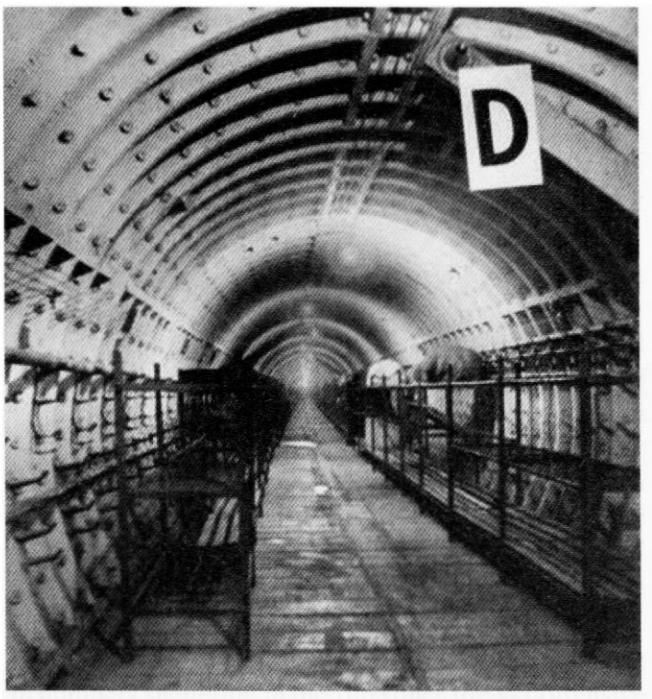


Aldwych Station – the Aldwych shuttle was suspended during the war so shelterers were also able to use the track

It was in the matter of structural design of deep shelters that the Hailey Conference made several suggestions. Based on their own and London Passenger Transport Board research, if these suggestions could have been applied to those structures eventually used as shelters, it might have saved some casualties. Hailey had stated the obvious when he drew attention

> ...to a risk which is inherent in the concentration of people in large shelters. Should the protection afforded fail, through the use of exceptionally heavy bombs or for any other reason, a single bomb might wipe out the whole of the occupants of a shelter. Disasters in civil life have shown that such mass catastrophes have a far greater effect upon the public mind than a similar number of isolated casualties.

The partially completed Bethnal Green underground station (with a tunnel but no railway track) was one of several uncompleted structures that were taken over in October 1940 by local authorities for use as shelters. At the time there was but a single entrance to a flight of 12'3" wide stairs. There were 19 steps down to a landing then a 90-degree turn and seven further steps to the booking hall. When the public seeking shelter began to rush the entrance, a woman carrying a baby down the stairs stumbled and fell – the resulting crush jammed the stairs and 173 died. If the structure had been built as a deep shelter, the architects may well have noted Hailey's point:



Beds line the unfinished Central Line tunnels at Bethnal Green in 1940

> The first question is whether entrances should take the form of ramps or of stairs. We feel very strongly that ramps are to be preferred. Not only are they better adapted to the movement of a crowd in a confined space, but they present less difficulty to the removal of casualties should need arise.

The Cabinet had long been aware that fatalities occurred if bombs penetrated deep into Tube stations and the LPTB Board heard, on 7 November 1940, of recent tube station incidents where bombs caused considerable damage below. The incidents included:

> Trafalgar Square (40' crater 42' below street level); Bounds Green (37' below street level); Balham (70' diameter crater containing 5,000 tons of clay) and two incidents at Euston (47' 6" and 56' below street level.) [12]

Morrison had made a combative BBC Home Service broadcast on 3 November tackling head-on the campaign for deep shelters, and announced a change in policy under which a limited amount of deep shelter would be provided in the London Region by tunnelling under the Tube system at selected stations. Not only was Morrison new *en poste*, but his predecessor Sir John Anderson was a full member of the War Cabinet with responsibility for co-ordinating Home Affairs.

Faced with the broadcast only a month after his appointment, Morrison sought Cabinet approval of his script. The Cabinet toned it down, at Anderson's request, ensuring that Morrison's talk be 'not represented as a reversal of existing policy'. Anderson told the Cabinet that Morrison's new Tube tunnels:

> ... did not represent any fundamental departure from existing [shelter] policy ... to extend the Tube shelters linked to the Tube system would require very careful handling. There was a risk, if this proposal was taken up by the public in the wrong way, it might be used to discredit the whole of shelter policy.
>
> Cabinet Conclusion The question was one of emphasis in presentation ... the statement should not be represented as a reversal of existing policy. [13]

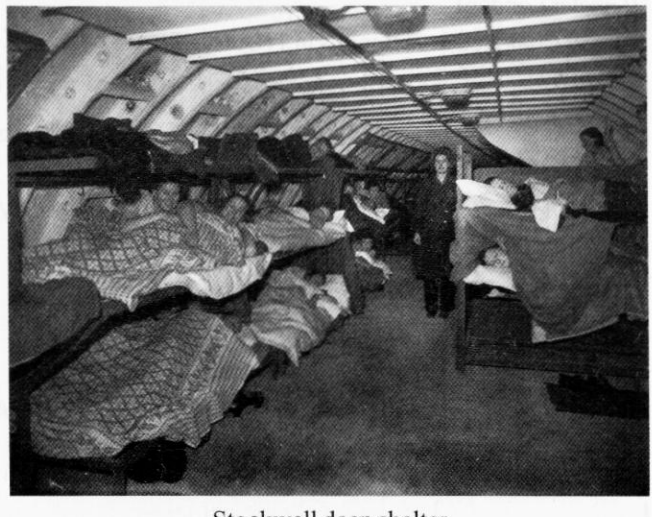
So Morrison's amended script (printed in *The Listener*, as 'We Have Won the First Round') concentrated on his aim of providing 'More and Better Shelter.' He announced that he would continue surveying basement shelters, provide for the extension of surface communal shelters, provide more steel for building the larger Anderson shelters and for extending the smaller to 6 feet to take bunks. Turning to deep shelters he said:

> I have consulted the best expert opinion, including some fresh minds and I have come to three conclusions: a) Anything like a universal policy of deep shelter, for the whole people or the greater part of it, is beyond the grounds of practical possibility. b) No appropriate amount of deep shelter, even in the most favourable event, can be ready until this winter is over. c) In some places and in some circumstances, the construction of deep shelter is practical and will be undertaken. The deep shelter provided in London by the Tube will be extended by tunnelling.

The Use Made of London Shelters

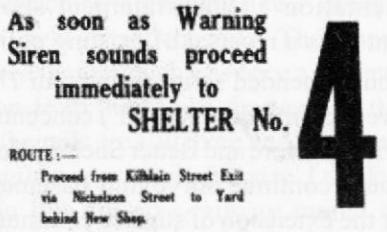
Providing sufficient shelters for the London Region's1939 population of some eight million was a massive task and although the programme started late, the year between the Munich crisis and the additional year of the 'phoney war' provided useful preparation time. Once the Tube stations had been made available as night shelters and they and other public shelters had been made more comfortable, with (very) limited toilet and refreshment facilities, Morrison was able to claim in his 3 November 1940 broadcast:

> Nearly 1,750,000 bunks have been ordered and installation has begun. Remember however that public



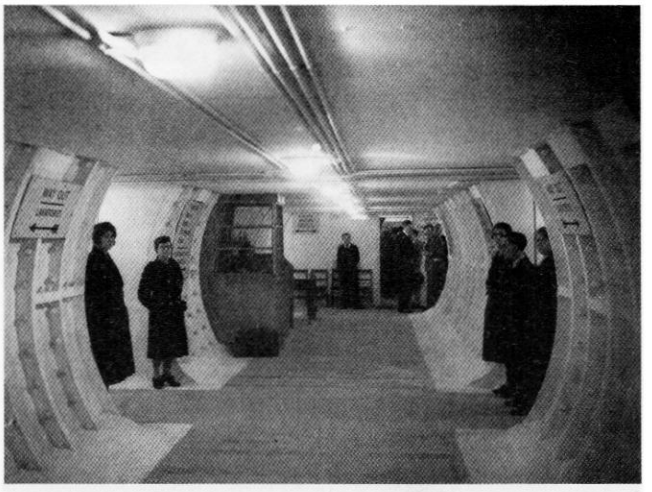
Stockwell deep shelter

shelters are not everything – far from it. Even in London the larger public shelters are used by less than one in six of the population as 85% sleep in their houses and flats with local protection, in their Anderson shelters or in communal public shelters.



Shelter conditions so improved that the Ministry of Health deplored the "harmful effect of too much publicity on the improvements and amenities now being provided in shelters in London". There was no doubt that press publicity on these improvements was encouraging considerable numbers of evacuated people to return from the reception areas where facilities for entertainment were limited[14] and Morrison's Cabinet Committee warned that:

> ... it was undesirable to give excessive publicity regarding Christmas festivities and general amenities provided in shelters. The Press should mention improvements in sanitation and medical precautions but not create the impression that public shelters were to be regarded as night clubs. The general impression should be that shelters were clean but not gay.[15]



Clapham South deep shelter

However, although the numbers sheltering in the Tube at the height of the blitz reached 177,500, numbers using all forms of public shelters dropped dramatically and only a fraction of Londoners used the shelter provided for them. The authorities started a weekly census of shelter usage and, although the popular image is of the population diving underground on the alert being sounded, the results supported Morrison's claim (above) that 85% of people slept in their houses with local protection. The use made of shelters in various parts of London was reported by the Regional Commissioner and is summarised in the tables below.

Groups of Boroughs	**Shelterers as % of Shelter Capacity**				**Shelterers as % of Local Population**		
	In Andersons	In Others	In All Domestics	In Public & Domestic	In Public	In Domestics	In Public & Domestic
Group 1 – Westminster / Fulham / Hammersmith etc	8%	5%	6%	8%	3%	5%	8%
Group 2 - Paddington / St Pancras / Islington / St Marylebone etc	14%	6%	9%	10%	3%	7%	10%
Group 3 - Stepney/ Poplar / Hackney/ Finsbury etc	34%	12%	24%	25%	12%	22%	34%
Totals for the London Region (Greater London)	22%	10%	19%	18%	3%	13%	16%

Source: Compiled from Reports in TNA HO186/952

Shelter Usage in Parts of London in Early 1941

Date of Tube Census (1941)	Public Shelter Provided by Night	Public Shelter Provided by Day	Numbers Sheltering in Tube System	Number of Bunks Provided
15 January	1,317,500	1,295,000	74,700	395,000
12 February	1,308,500	1,293,000	53,000	504,589
26 February	1,307,250	1,280,750	54,150	527,926 *
26 March	1,238,300	1,247,550	53,250	589,164

Source: Compiled from Fortnightly Reports in TNA HO186/952

* Includes 22,000 bunks in 73 Tube stations

Shelter Provision in London Region

There was a virtual lull in the enemy offensive from May 1941 until the Little Blitz of early 1944 and the V-weapon offensive from June 1944 to March 1945 when shelters were again in demand. In his report covering the first part of the V1 offensive, Regional Commissioner Sir Ernest Gowers reported that:

> ... the surface shelter has at last come into its own. It has stood up to the blast wonderfully, and is universally and deservedly popular. There is also a well justified [faith] in Andersons and Morrisons. Probably because there is no longer gunfire[16] and because the penetration of the missiles is so small, there seems to be no longer any great urge to get deep underground. Shelterers in the Tube rose to a peak of 73,600 at the end of the first fortnight and have steadily fallen since (helped by the transfer of 5,400 to the new Deep Shelters) to little more than half that number.[17]

The following table shows the understandable increase in numbers sheltering in the Tube once the V-1 offensive opened on 13 June 1944. The first of the new deep shelters were opened starting in July and the V-2 long-range rocket offensive opened on 7 September. The final V-weapons arrived on 27 March 1945, by which time even fewer people were seeking refuge in public air-raid shelters.

Canteen in Clapham South deep shelter

Night of:	Tube Traffic Stations	Non Traffic Tube Stations	New Deep Shelters	Total Shelterers
6/7 June 1944	9,780	2,142	Closed	11,922
13/14 June 1944	10,196	2,595	Closed	12,791
16/17 June 1944	49,264	3,725	Closed	52,989
19/20 June 1944	68,961	5,461	Closed	74,422
24/25 June 1944	66,730	5,540	Closed	72,270
30 June /1 July 1944	70,838	7,443	Closed	78,281
7/8 July 1944	61,085	5,641	Not quoted	66,726
14/15 July 1944	48,015	5,124	Not quoted	55,139
4/5 August1944	38,398	4,678	10,502	53,578
18/19 January 1945	14,149	3,077	5,680	22,902
6/7 April 1945	7,226	2,172	3,280	12,678

Source: Weekly census returns in HO207/226

Number of Shelterers in LPTB Stations and New Deep Shelters

	Clapham South	Clapham North	Stockwell	Camden Town	Belsize Park	Total Shelterers
Approx. Capacity	8,000	8,000	8,000	8,000	8,000	
Date First Opened to Public #	19 July 1944	13 July 1944	9 July 1944	16 July 1944	23 July 1944	
Numbers using Shelter on:						
4/5 August 1944	1,488	1,240	3,298	2,836	1,640	10,502
18/19 January 1945	1,487	Nil *	2,209	1,984	Nil *	5,680
6/7 April 1945	893	Nil *	1,227	1,160	Nil *	3,280
Public Shelter tickets current on 7 April 1945	1,747	Nil *	1,799	2,181	Nil *	5,727

Source: Weekly Shelter Usage Returns in HO207/226

* Some Deep Shelters were in use by the military and thus closed to the public

Dates from TNA CAB 121/214 dated 26 July 1944.

Deep Shelter Usage 1944 – 1945

Conclusion?

Having presented a rag-bag collection of facts, figures and opinions, grand conclusions would be inappropriate and all the topics mentioned above are worth a much more detailed examination. Nevertheless the provision of wartime air-raid shelters was a complex problem, the programme was late starting and, once it was in place, after the initial blitz the shelters were not heavily used.

Although massive physical damage was caused and nearly 30,000 Londoners died, the weight of attack suffered never reached either the intensity predicted or that inflicted on Germany by the allied air forces. Had the attack on London been much greater then doubtless the shelters would have saved even more lives but, fortunately, the government's shelter policy was not put to that extreme test.

1 Cmd. 5932 Air Raid Shelter Policy, December 1938.

2 Cmd. 6006 Air Raid Shelters Report of the Lord Privy Seal's Conference, April 1939.

3 House of Commons Debates, 10 November 1932

4 House of Commons Debates, 12 November 1936

5 TNA HO186/2352, April-June 1944 p.1

6 N J McCamley *Secret Underground Cities*, Pen & Sword, 1998

7 TNA CAB16/172 Committee of Imperial Defence, ARP Sub-Committee - Report of the Warren Fisher Sub-Committee, 30 June 1937

8 TNA HO207/1101, Hodsoll's Report of visit to Ramsgate, 4 February 1941

9 Churchill Archive, Cambridge, Hodsoll Papers 6/2, The Early History of Civil Defence, Chapter 16 Problems of the Blitz - 1941

10 E Jones, R Woolven, S Wessely and W Durodie 'Public Panic and Morale: World War Two Civilian Responses re-examined in the light of the current anti-terrorist campaign ' Journal of Social Medicine in late 2005 and, revised, in Journal of Risk Research, Vol. 9, No.1, pp. 57-73. (Jan. 2006)

11 Cmd.6583 Report on an Inquiry into the Accident at Bethnal Green Tube Station Shelter on the 3rd March 1943, (not published until January 1945)

12 LTPT Board Minutes at MRO Ref 1297/LPT01/05 dated 7 November 1940 - in London Metropolitan Archive

13 Cabinet Conclusions 280 (40) 30 October 1940

14 CAB 75/3 Exec S-C 32nd Meeting 5 December 1940

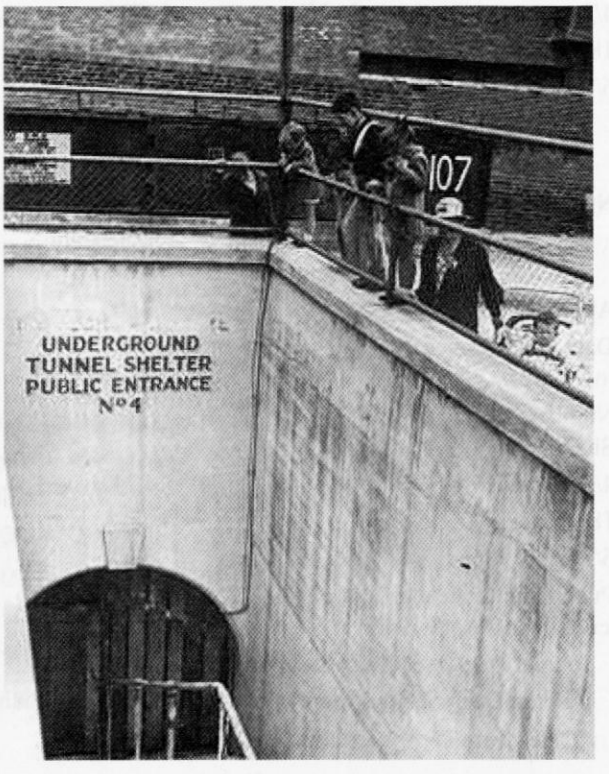
15 Ibid. 36th Meeting 19 December 1940

16 AA Gun belt was moved to the south coast in July 1944

17 HO186/2352 Quarterly Report April - June 1944 p.2

Servery in the Ashley Road deep shelter in Epsom, Surrey. Photo by Nick Catford

Clapham South deep shelter in 2009. This is the best preserved of London's deep shelters retaining most of its beds and signage. Photo by Nick Catford



No. 4 Entrance to Ramsgate deep shelter in Kent

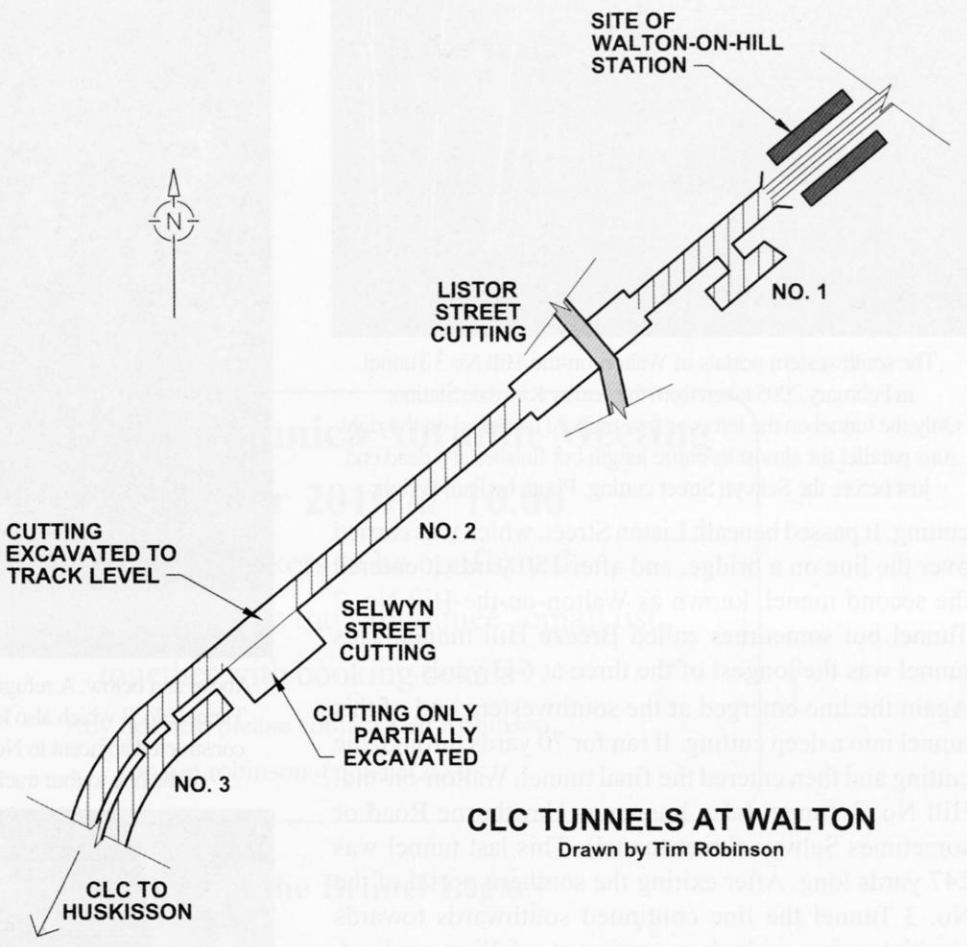
The CLC Tunnels at Walton, Liverpool

by Paul Wright

The Cheshire Lines Committee (CLC) was a joint railway company consisting of three partners: the Manchester, Sheffield & Lincolnshire Railway (MSLR), the Midland Railway (MR) and the Great Northern Railway (GNR).

On 13 July 1874 the CLC obtained an Act to build a 'North Liverpool Extension Line' which would provide a connection from its main Liverpool to Manchester line to the deepwater berths of the rapidly expanding north Liverpool docks.

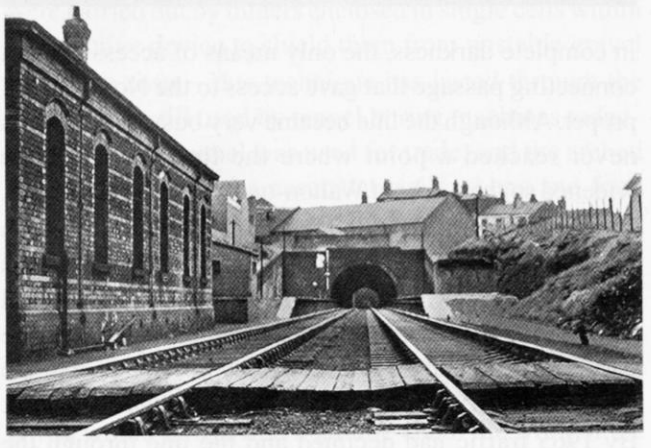
The CLC chose a route for the line that skirted through agricultural land to the east of Liverpool, running from a junction with the CLC main line at Halewood and passing through small villages at Gateacre, Knotty Ash and West Derby before reaching Walton. From Walton the line turned to the southwest and ran down to the docks to terminate at Huskisson Dock. The only major civil engineering works on the line were at Walton where three tunnels had to be dug to carry the line through a sandstone ridge which surrounds the city of Liverpool.



CLC TUNNELS AT WALTON

Drawn by Tim Robinson

The tunnels started at Walton-on-the-Hill where a passenger station was provided and emerged on the east side of Kirkdale Station which was located on the Lancashire & Yorkshire (L&YR) Railway's Liverpool to Bolton line. Starting at Walton-on-the-Hill the first tunnel was called Walton-on-the-Hill No. 1 Tunnel but was also sometimes referred to as Walton Hill tunnel; it was 229 yards long. The line emerged from Walton-on-the Hill No. 1 Tunnel at its southwestern end into a deep



The closed Walton-on-the-Hill station in July 1961 looking southwest. The portal of Walton No. 1 Tunnel can be seen beyond the station. Photo by Les Rogers

Looking southwest at the northeast portal of Walton-on-the-Hill Tunnel No. 2 which is located in a cutting at Liston Street. The land on the left side of the cutting had been earmarked for a widening of the cutting which would have allowed two extra lines to have been laid. Photo by Paul Wright

The southwestern portals of Walton-on-the-Hill No 3 Tunnel in February 2005 taken from the nearby Kirkdale Station. Only the tunnel on the left ever saw trains. The tunnel on the right runs parallel for almost its entire length but finishes at a dead end just before the Selwyn Street cutting. Photo by Paul Wright

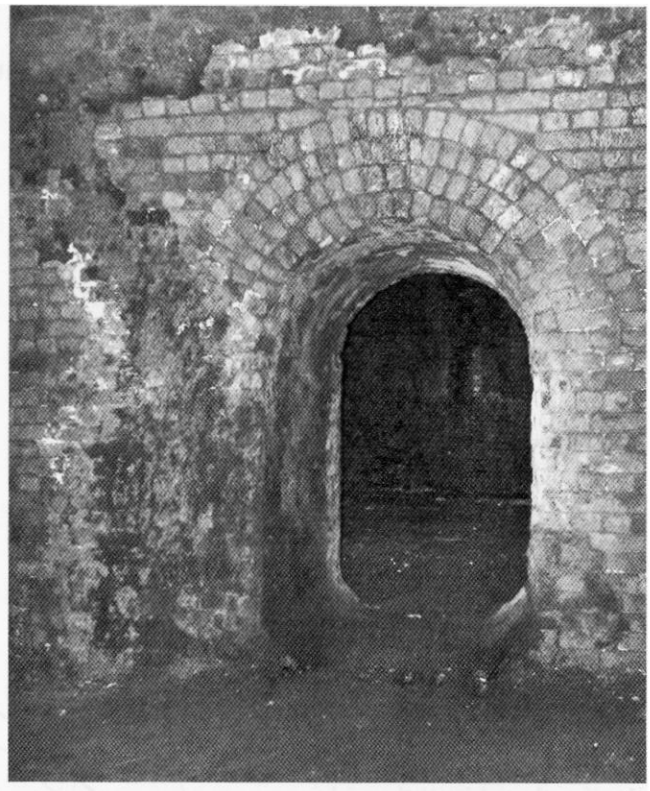
cutting. It passed beneath Liston Street, which was carried over the line on a bridge, and after 150 yards it entered the second tunnel, known as Walton-on-the-Hill No. 2 Tunnel but sometimes called Breeze Hill tunnel. This tunnel was the longest of the three at 643 yards.

Again the line emerged at the southwestern end of this tunnel into a deep cutting. It ran for 70 yards through the cutting and then entered the final tunnel, Walton-on-the-Hill No. 3 Tunnel (also known as Hawthorne Road or sometimes Selwyn Street tunnel). This last tunnel was 247 yards long. After exiting the southern portal of the No. 3 Tunnel the line continued southwards towards Huskisson in a wide deep cutting at a falling gradient. Running parallel to it on the west side was the Liverpool to Bolton line of the L&YR.

A contract was let for the construction of the entire line, including the tunnels, to contractors Kirk and Parry, and work started on the tunnels in September 1875. The specification for the works stated that the tunnels should be able to accommodate four tracks but that only two tracks would be laid initially. The CLC had specified this so that at a future date they would not have to undertake expensive works widening the route of the line through the tunnels.

To facilitate future widening the rock cutting at Selwyn Street was partly excavated to the east of the line from street level to about tunnel roof height. At Liston Street space was kept free from development on the east side of the line to facilitate widening to four tracks. At the Kirkdale end Walton-on-the-Hill No.3 Tunnel was partly built as a double tunnel. The bore at the southwest end of the tunnel was a double bore but on the east side of the line the tunnel did not continue quite as far as the Selwyn Street cutting, instead ending at a big slab of sandstone rock.

At No. 1 Tunnel a parallel tunnel was excavated on the east side of the line but it did not exit at either Liston Street cutting or Walton-on-the-Hill station. It remained



Above and below: A refuge point inside the Walton-on-the-Hill Tunnel No. 3 which also leads into the parallel tunnel that was constructed adjacent to No. 3 tunnel to facilitate the widening of the line to four tracks. Upper photo by Paul Wright

in complete darkness, the only means of access being a connecting passage that gave access to the No. 1 Tunnel proper. Although the line became very busy traffic levels never reached a point where the line needed to be widened so the works at Walton-on-the-Hill were in vain.

The primary purpose of the line had been to move goods but from 17 July 1880 to 1 May 1885 passenger trains running between Huskisson and Liverpool Central passed through the tunnels. The tunnels remained part of the CLC until 1 January 1948 when they became part of the nationalised British Railways (London Midland Region). By 1965 traffic had declined and the line through the tunnels was singled. Goods trains continued to pass through the three tunnels until August 1975 by which time only one train per day was running between Edge Hill

and Huskisson. The single line remained in situ until the spring of 1979 when it was lifted by a demolition train that became the last train ever to pass through the three tunnels.

The tunnels proved to be a popular playground for children and in the early1980s the northernmost tunnel portal of the No. 1 Tunnel was bricked up and a metal door was fitted to prevent access. The door was soon broken down. In the late 1990s palisade fencing was erected across the tunnel mouth.

By 2007 the cutting between No. 1 Tunnel and No. 2 Tunnel at Liston Street had become filled with domestic rubbish which had been thrown down from the street for over three decades. High fencing was erected at Liston Street and the cutting was cleared out. In 2010 the condition of the tunnels appeared to be quite good although drainage works have been carried out inside No. 1 Tunnel. Spoil and other material have also been dumped inside No. 1 Tunnel lifting the level of the Tunnel floor by a few feet. Tunnels 2 and 3 remain relatively clear.

Sources

An Illustrated History of Liverpool's Railways – Paul Anderson

BackTrack Magazine – July 1995 – The CLC's North Liverpool Lines – John C Hughes.

The Cheshire Lines Committee – Paul Bolger.

Subterranea Britannica Autumn Meeting

16th October 2010 @ 10.00

Venue and speakers to be confirmed

Updates will appear on the "announce" email list together with booking details

Any queries, please contact Tim Robinson on tim.robinson@pro-net.co.uk

Investing in the Brunel Legacy

The Brunel Tunnel

Rotherhithe is a former East London line station, currently closed and set to benefit from the current renovation programme before reopening in 2010. The station itself is in a prominent physical location, linking up to the south portal of the Thames tunnel. The project was developed by two famous engineers, a father and son team, Sir Marc and Isambard Kingdom Brunel in the 19th-century. The tunnel at Rotherhithe was the first tunnel constructed under the Thames and under water. In 1825, excavations were carried out by miners enclosed in single cells within a protective device to shield them from unstable gravel under the river – this technique has lasted through the years and is still used by tunnel boring machines today.

Originally the tunnel was used for trade, and the arched central wall housed amusement stalls, shops and food stands. It also achieved fame for hosting an underwater banquet and underwater fairs for 19th-century revellers. For a while it was a great tourist attraction, but later crime crept into the area, standards declined and its popularity faded. The tunnel was later incorporated into the first East London Railway in 1869.

If you would like to find out more about the work of the inspirational father and son team, visit Rotherhithe's Brunel Museum which pays tribute to the famous works of the Brunels. Please contact the museum on (020) 7231 3840 visit or the website www.brunel-museum.org.uk for further information.

Brunel slab

Transport for London and Balfour Beatty-Carillion Joint Venture have funded the design and construction of a new floor in the Brunel shaft. This new floor level at Rotherhithe will provide space for a future display area extension and will be presented to the Brunel Museum, a gift to the local community.

Stats and Facts about the new Brunel slab

The slab floor measuring 12.6 metres in diameter is constructed from reinforced concrete and is a considerable engineering achievement. It's designed to sustain a load of 20kN/m^2, it spans across the (55 foot diameter) shaft, and is supported by the tunnel's walls. The slab is 11 metres from the top of the shaft, and 7.5 metres below ground level. Overall the shaft is 19 metres deep from track level to the top of the shaft.

Construction of the floor has been finely calculated to meet safety requirements and has been approved by the local authority, Southwark Council. Work on the floor began in June 2008 and was completed in October.

[from *East London Line News,* issue 5, December 2008, produced for London Overground by Balfour Beatty Civil Engineering Ltd]

Glick-Ems at Hahn

by Tim Robinson

The airport at Frankfurt Hahn sits over to the west of central Germany some 35 miles from the border with Luxembourg. Don't go there if you fancy afternoon tea and cakes in Frankfurt – it's 75 miles to the east.

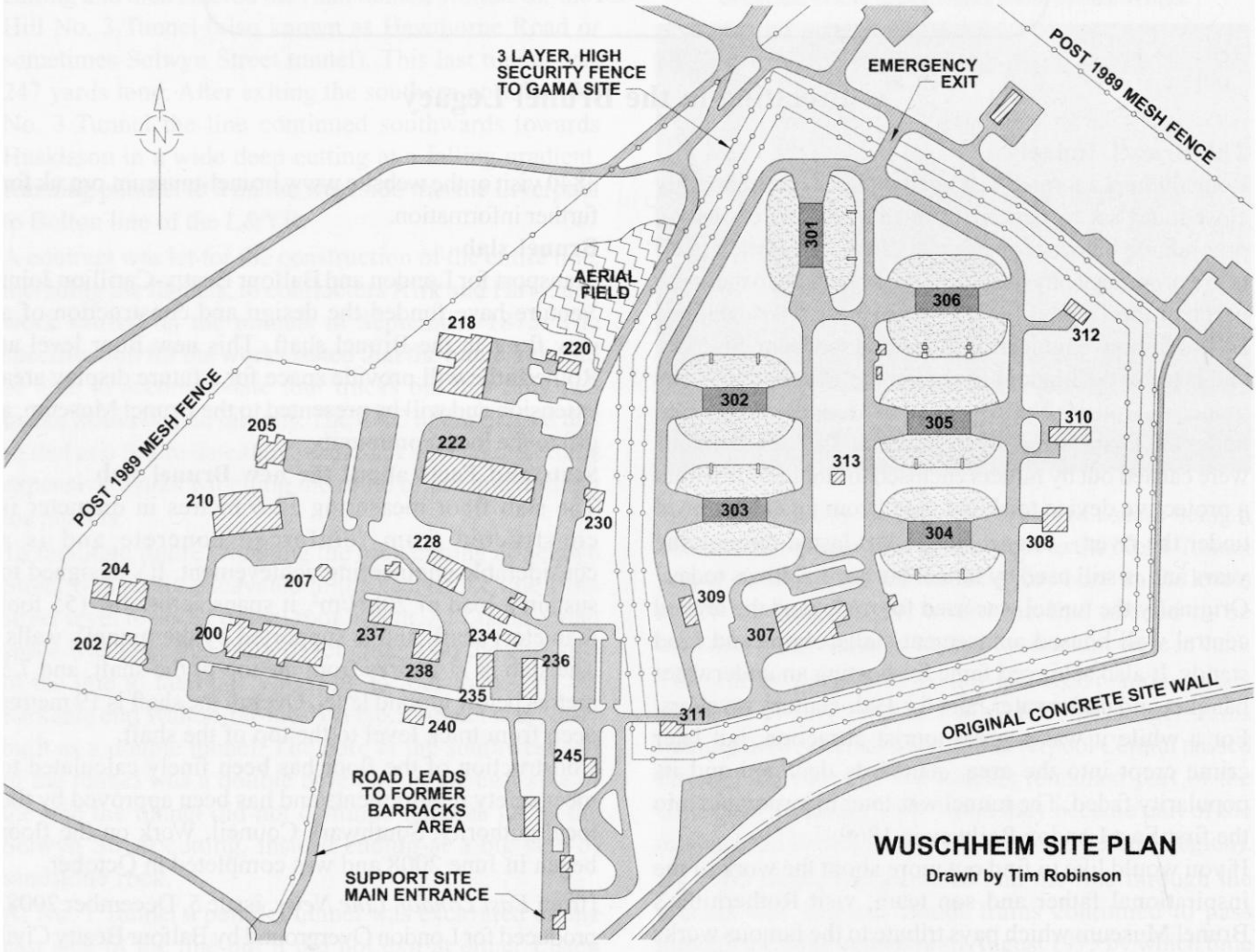
Do go there if you fancy a day of hardened aircraft shelters, barracks, aircraft hangers and bomb stores for Hahn Air Base – as it was known during the Cold War years – was a frontline NATO base for nearly 40 years. The USAF first took charge of the air base from the French in 1952 with the last squadrons leaving in 1991.

Main resident during those years was the 50th Fighter Wing featuring a vast array of aircraft from F-86 Sabres through to F-102 Delta Daggers, F-4 Phantoms and finally ending up with F-16 Fighting Falcons. Numerous smaller 'wings' shared the base for varying periods of time giving NATO a permanent nuclear strike capability in the event of a Soviet invasion of Western Europe. In addition to this, Hahn provided logistical and weapons support for the nearby Matador and Mace surface-to-surface missile launch sites during the late 1950s. Altogether, a chequered history with plenty to see in a day.

June 2009 first visit

With all this in mind and a cheap Ryanair flight burning a hole in our pockets, Bob Clary, Steve Underwood and I found ourselves en route to Hahn one June morning back in 2009. Bob had been once before so we had a good list of 'must-sees' and a few new things to add on if there was time. The morning turned out to be superb with something of interest at every turn. With lunchtime beckoning we headed north to the town of Kastellaun to find sustenance. There was method behind this drive as Hahn is also home to one of the six GAMA sites dotted across Europe.

GLCM (pronounced *glick-em*) is short for Ground Launched Cruise Missile and from that comes **G**round Launched Cruise Missile **A**lert and **M**aintenance **A**reas. A bit of a mouthful but if I say Greenham Common, you'll know what I mean. For reasons no one could explain, the Hahn site is also known as Wuschheim (from the local village) in most NATO documentation but Pydna locally.



The GAMA sites came into effect after NATO decided to upgrade its nuclear forces in the European Theatre at the end of the 1970s. The emphasis moved from air-dropped nuclear weapons to mobile ground-launched missile systems (Pershing II and Tomahawk) freeing the bomber force to target the Soviet SS-20 launcher sites.

Having duly found our way to the site we peered through mesh fences topped with razor wire at the tall observation tower and large, grass-covered hangars that once housed our last line of defence against an all-out Soviet attack. For me, this long-distance view wasn't enough so I elected to wander up to the main entrance in a futile attempt to see if the gates were open. Meanwhile, Bob & Steve headed back to the car, vowing to come and find me if I didn't show my face in about half an hour or at least start raising funds to get me out of wherever I might have been locked up…

Rounding the slight curve to the entrance, the site was deserted as far as I could see but more importantly the gates were open! Thirty minutes was never going to be enough when I was probably 15 minutes from the car but none the less I raced round as many of the identical garages as I could, trying to take some useful photos, keeping out of sight where possible and generally taking in where I was and what I was seeing.

I was lining up a long-distance shot from one garage to another when I first heard it. A car was on the move. Stepping out of sight I watched it slowly drive past the other end of the garages. It didn't stop and my first thought was "that was lucky". This was quickly followed by "hmmm… suppose they lock the gates".

Now I'm no runner – the word 'marathon' still means a chocolate bar to me – but I reckon I could have been up for a medal if someone had started a stopwatch. Amazingly, the gates were not shut when I got to them, nor was there any sight or sound of the car. I was sure I'd not imagined it but decided that was enough excitement for one afternoon and headed back to our car. Being way over the agreed time I half expected to meet Bob and Steve on their way to find me but alas, they were both asleep when I tapped on the windscreen.

Second visit in October 2009

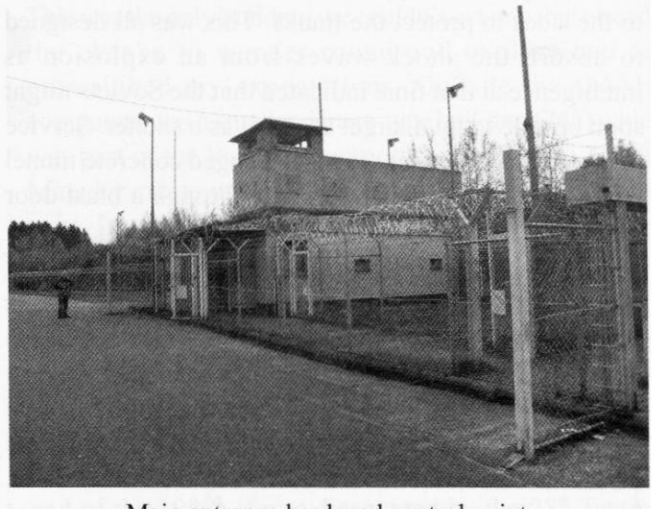
Back home again, I did some more research about the site, who was based there and how it all fitted into the scheme of things. The fenced site with the grassed hangars I had briefly explored was supported by a series of other buildings on the outside, all of which appeared to be empty – some had even been demolished. Emails followed to various websites and this led to contact with a young lad named David who lived in the village close to the base and had spent many hours exploring the place.

I asked him if he had any more information about the buildings and if he knew who owned the site as I'd like to arrange a visit. Weeks passed and I assumed the email address wasn't working when all of a sudden I got a reply. He apologised for his poor English but I could easily understand what he was writing. It would have been a different matter if he'd written back in German!

I explained who we were, what we did and why we wanted to visit. He confirmed that the Bundeswehr now owned the site and used it for training, storage and once a year, leased it out for a huge music festival called Nature One. We could attend the festival but it was unlikely we would see much of the site as it was covered in stages and revellers (amazingly the Google Earth view shows this festival in full swing!). However, his dad was in the Bundeswehr and they were having an 'opening day' as they had just finished building their new clubhouse. We would be more than welcome to come over and be their guests. Sometimes, these things fall into place faster than you can imagine! We would meet at an old station just up the road and then follow them into the site – it was like something out of a Len Deighton spy book.

In due course October 31st, 2009 arrived and yet again the three of us were on the Ryanair flight to Hahn. Joining us were Nick Catford and Rob Titmus who had been tempted by the possibility of seeing this place. I say possibility as I was still unsure it was all going to work out – it just seemed too simple. Hire car collected, we headed towards the RV point and there, parked up was David and his father, Mike. Within ten minutes we were on site and suddenly I realised it was going to be a superb day!

Our first port of call was the new clubhouse, built in an old telecoms building with massive blast walls surrounding it; their previous clubhouse had been broken into a few times and they needed something with a bit more security. We signed in as guests, had a quick drink to warm us up and then headed off with David for the tour. We elected to do the GAMA part first so headed for the real entrance – the one I had originally found open was the emergency exit. The plan on page 26 shows the GAMA site plus the support buildings to the west. The buildings are numbered and referred to throughout the article.



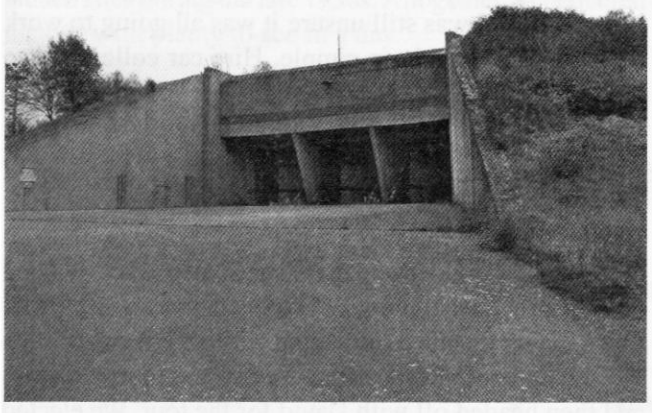
Main entrance hardened control point.

This entrance (311) is guarded by a hardened control point with defensive firing positions above, two sets of sliding vehicle gates and a fenced personnel corridor. A wooden observation point has been added on the top level although there is no clue whether this was original.

The site is well spread out with only a few additional buildings to the main garages and dominated by a central observation tower. Our route took us past an open hangar-type building (309) which was for storing the missile cases – individual and spare TEL units – but was now used for general storage. On this site there are six shelters but this varied from three to seven shelters for the other sites across Europe. All featured the same elements, storage hanger, maintenance and missile storage facility, hardened entry point, observation tower and shelters, but the layouts were quite different.

Missile Launch Control

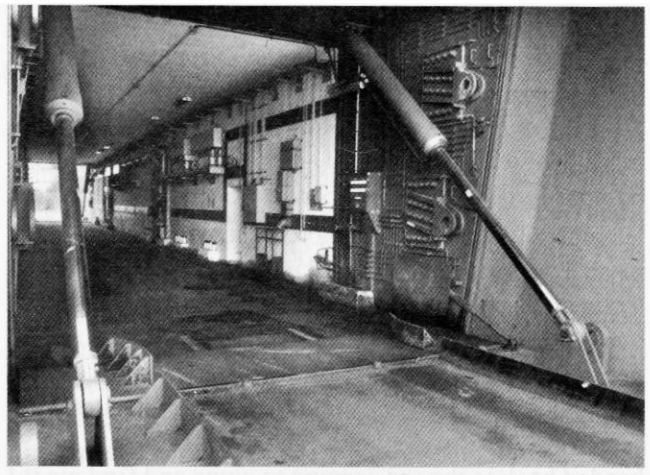
Now we had time to enjoy the site, we were able to take in the enormity of the shelters, the incredible plumbing systems for the doors and many other aspects.



Typical vehicular entrance to a shelter.

Each shelter (301 – 305) contains 3 garages with vehicular access from either end and hardened blast doors that fold down into a pit. The top of the shelter was protected by a 5-foot-thick concrete blast cap covered by another 8ft 6ins layer of sand, both which extended about 35 feet to the sides to protect the flanks. This was all designed to absorb the shock waves from an explosion as intelligence at that time indicated that the Soviets might soon be able to hit a target as small as a shelter. Service personnel would enter via a dog-legged concrete tunnel at the side of the shelter and then through a blast door into the garages.

Inside the garages there would be two Launch Control Centres (LCCs) and four Transporter Erector Launchers (TELs) plus a recovery vehicle, if that was not in the maintenance facility. If deployment was requested, each TEL would leave the garages and drive to the on-site maintenance facility building (307) where the missiles would have been fuelled and loaded into their canisters, four missiles per vehicle in one canister. Once aboard



Blast door to one of the garages. Photo by Nick Catford

the TELs, they would team up with their respective LCCs and head off to pre-surveyed launch sites to await final instructions.

One shelter (306) was always kept at QRA status (Quick Reaction Alert) where the cruise missiles would already be on board the TELs, fuelled and ready to go. This shelter differed from the rest by having a two-level crew compartment built into one side of the 'blast bank' and accessed by more complex tunnels. It was manned around the clock against a pre-emptive strike, so should a warning of such an attack be received, the LCCs and TELs would simply have driven out onto the hard-standing of the site and launched from there.

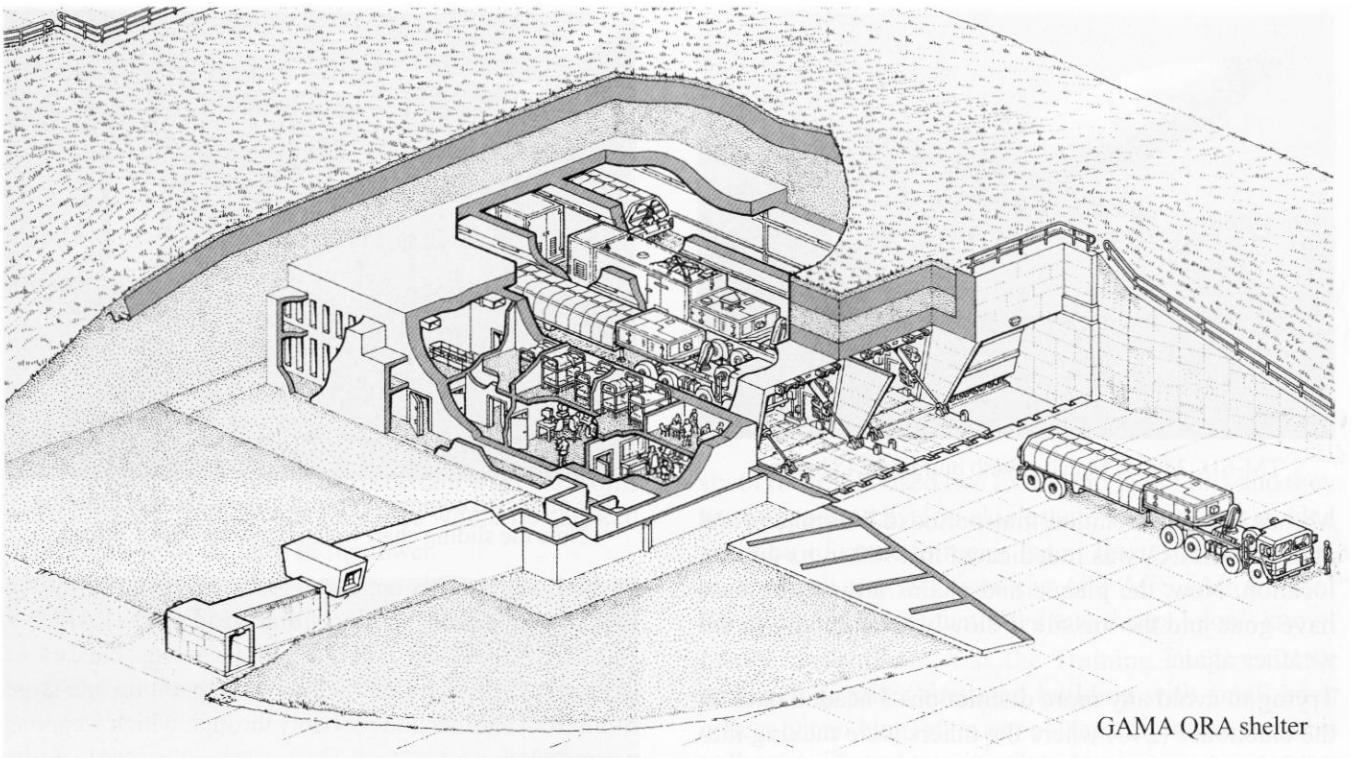
The diagram on page 29 shows the compartment arrangement of a QRA shelter.

Two-thirds of the lower level housed a plant room that was protected by a slotted, blast attenuator chamber to dissipate the increased air pressure from an explosion; the rest was a communication suite. The upper level housed four bedrooms, a toilet and a lounge.

Sadly, our explorations found the upper level had succumbed to arsonists which seemed strange for such a secure site. It may have happened during one of the festivals as all these buildings are 'in use' but if so, this was the only real sign of any kind of vandalism we'd seen apart from a small amount of graffiti.

Behind the row of three shelters but still within the compound were three smaller buildings. One (308) was a surface, bunker-type explosives store with a stencilled note detailing the explosives type 1.3 with a limit of 5500lbs. The next (310) was a large servicing building with an armoury, offices and toilets plus a loading bay complete with gantry and hoist. Interestingly, north, south, east and west were stencilled on the walls inside the bay which must have meant something to those working there.

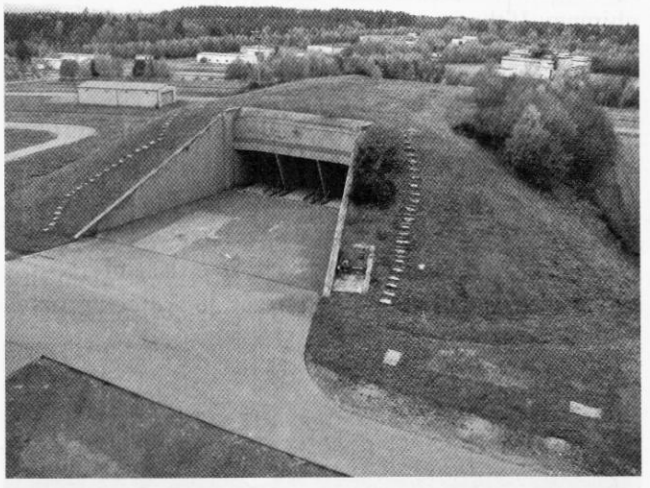
Lastly (312) was a twin garage and office building with a curious aircraft-type seat bolted to the floor of the main room in front of a desk. Maybe it was the most comfortable seat around! This building had numerous defensive gun slots around the external wall including



GAMA QRA shelter

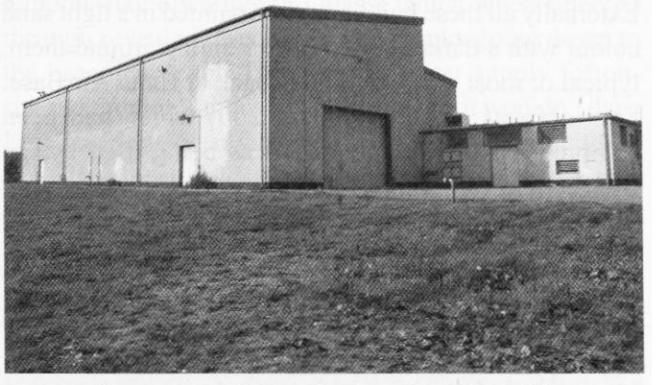
one in the toilet – useful should you be settling down to the morning newspapers and the Soviets come through the fence!

The central observation tower (313) housed a small comms rack area in a single-level basement and the rest was metal staircase up to the top. This had suffered from some vandalism with smashed windows and interior fittings but the view of the overall site was excellent.



Shelter 303 with the support buildings in the background.

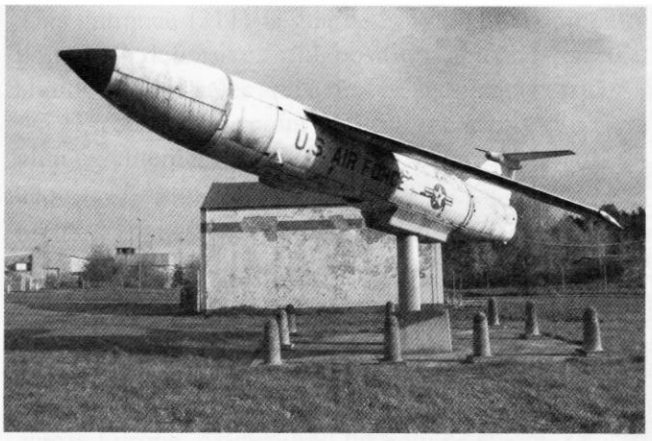
Lunchtime was nearing so I started to make my way back trying to capture the last views of the site from every angle. The final building to see was the maintenance facility and missile storage (307) but sadly this could only be viewed from the outside. It was in three distinct sections with the central area containing workshops, stores and offices on two levels. This was flanked on one side by a vehicle bay and the other by a missile bay, each served by an overhead gantry for loading and unloading. A smaller single-level extension had been added at some stage though its purpose was not clear.



Maintenance facility and missile storage building.

This was the only building we couldn't get into, but already the chance to wander round and explore had far outweighed my expectations. Outside the GAMA compound was a smaller garage-type building (245) which was part of the logistical support for the TM-61 Martin Matador cruise missile launch site, 3 miles to the south west. In case we were unsure what this missile looked like someone had conveniently put one on a pedestal just past the building!

This was originally dedicated as a monument in the Missile Support Area at Bitburg Air Base in September 1962, the month the last operational Matador was taken out of service. It languished there for many years, neglected and hidden from view by overgrown trees. Towards the end of the 1980s it was discovered by the 38th Tactical



TM-61C Martin Matador with building 245 behind.

Missile Wing, dismantled, transported to Wuschheim and after some TLC, was rededicated in 1989 in its current location. Now, the plaque and chains around the base have gone and the missile is slowly succumbing to the weather again.

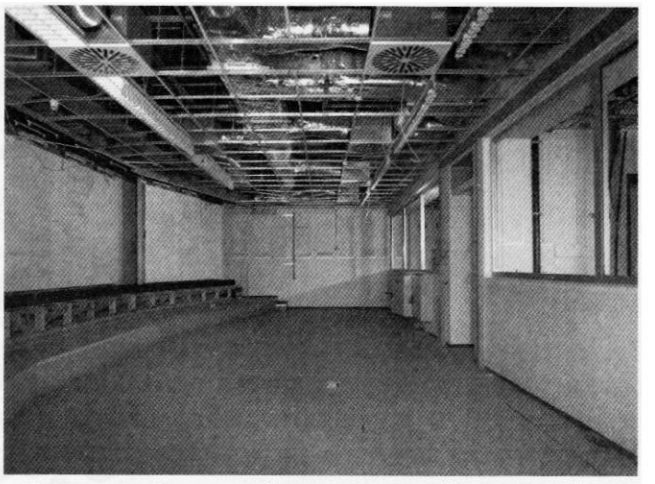
Trying to avoid any more distractions I headed back to the clubhouse (240) where the others were tucking into BBQ lunch and we sat and chatted about what we'd seen, what each of us had missed, and plans for the afternoon.

Afternoon delight

David had been joined by a couple of friends and, fully refreshed, we were now going to see the rest of the support buildings outside the GAMA compound. Externally all these buildings were painted in a light sand colour with a darker brown band running around them, typical of most of the buildings back at Hahn Air Base. First off was an office block (200) which had been comprehensively stripped and was being used by the Bundeswehr for training on the first floor.

Missile Command Post building, the two porches protect emergency exits from the "bunker".

However, on the ground floor was the missile command post which still retained an EMP room, angled chart walls and offices looking out on the charts where the war situation would have been monitored. This was a nice little gem, as were the words "MISSILE COMMAND POST" painted on the corridor wall. Next was a far more hardened building (202) with large blast doors protected



The protected command post in ground floor of building. Note the sliding chart walls. Photo by Nick Catford.

by high walls. This appeared to be an armoury by the look of the signs on the doors inside, reading "WEAPONS STORE", "AMMO STORE" and various classes of explosives, plus the steel 'windows' separating one large room from another and probably through which weapons were issued.

Building 204 was a simple vehicle garage with roller-shutter door and various offices inside, sadly well trashed. The next one (210) must have been deemed important as it had the word "Supply" written on the end wall and a covered, ramped loading dock with roller-shutters. It was completely open plan inside but empty. To the right, standing in the middle of a grassed area and flanked by conifers was a large octagonal wooden shed (207) which upon closer inspection, had a central raised fire pit and chimney. If there were social gatherings on site this must have been the focal point.

Tucked away in the corner was another garage-type building (205) with rusty double doors and broken windows but on the external wall was some original wall art from the various missile units to be stationed there. Although it had suffered from the weather you could clearly make out a GLCM flying over a land-and-sky globe surrounded by a cobra. Back in the central area

Flight artwork from building 238.

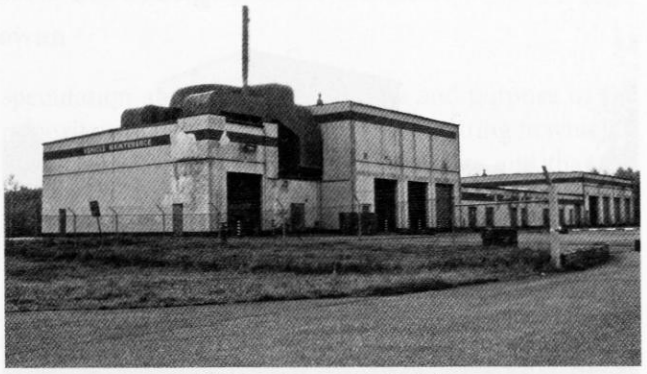
was the gym (237) whose last visitors were not there to do press-ups and another vehicle-type shed (238) that was clearly an integral part of the site. I'm making this assumption as it had the most wall art on any building there as the photo on page 30 shows.

Time was pressing on and I still had the two biggest buildings to do. It would have been nice to have a cup of tea but sometimes you have to forgo these pleasures! The area I'd just been round was all in one compound with no internal gates or fences and a single watch tower (228) reminiscent of the last type used on the Berlin Wall or German – German border. This was accessed via a spiral staircase off a single-level office-type building. Internally there was little left to ascertain what the rooms were for apart from where your pass would be checked before you went on duty in the tower.

Support area watch tower.

Behind here was a separate compound which housed the vehicle maintenance sheds. The fence had disappeared but a ditch with the odd remaining fence post clearly showed its line. The maintenance facility building (307) in the GAMA site was for loading and missile fuelling whilst this one (222) was for all work on the LCCs, TELs and other support vehicles. The building was huge as was the hard-standing around it, but when you consider that each GAMA shelter – and there were

Huge vehicle repair bays in the vehicle maintenance building.



Vehicle maintenance building.

six of those – housed two LCCs and four TELs and they were supported by 16 vehicles and 69 men, you needed a fair bit of space to repair them! Interestingly though, on the wall was art from the 602 ACS (Air Control Squadron) so where that fitted into things I don't know!

Lastly, well almost, was the Training Facility (218), another big roller-shuttered building with small back offices but nothing left in any of it apart from an extensive collection of a/c ducts at ceiling level.

Heading back to the main road, I saw a smaller, nondescript building hidden in the trees but with 220 stencilled on it, so it must have been reasonably important and thus worthy of a look. Inside was a comprehensive pumping and pipe work layout in the basement which was overlooked from a walkway. To the left were three window-like openings (no glass) which when I peered through revealed three huge water tanks going down to the basement level. This was the water supply for on-site fire fighting although I could imagine it wouldn't have lasted too long on anything serious! Behind this building was a large open field where all the communication aerials would have been located. A couple were still proudly standing there giving an idea of how busy this field would have looked during the Cold War.

Now out on the main road I passed another hardened building (230), much like 202 with a blast door behind high angled walls. No real clues as to what went on again although there was a lot of power and a/c and several of the rooms had EMP protection. Externally there was what looked like air intake shafts on the first floor and possibly an exhaust from a generator.

Further down on the right were a cluster of buildings on the corner of the main junction. Two, (235) and (236) were on either side of a small yard and looked like general storage sheds with rollershutter doors. No. 236 had the words "Grounds And Equipment" on the end wall. Slightly smaller and to the back of the group was no. 234 which had "Mechanical Section" down the long side of the building.

It was definitely time for a hot drink and more importantly thoughts about eventually heading back as the day had shot by like it so often does when you're immersed in a

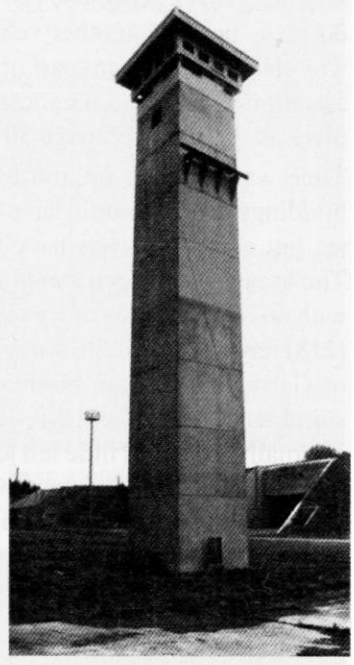
Well-protected building but of unknown use.

place. The others had already embarked on thawing out so I joined them over a coffee and we discussed the day with David and Mike. Some of the other Bundeswehr people joined the chat as they were intrigued about why we found this place fascinating, so this stretched our pidgin German quite a bit!

NATO art exhibition

We eventually got talking about the barracks area of the site and David suggested we take a walk over to it before the light went for the day. The barracks had been demolished a few years ago when there was some thought about redeveloping portions of the site, but nothing had come of that. They had been comprehensively removed with nothing left but some tiled floors where the two wash-blocks had stood and some wall lines. However, what was superb were the paintings on the wall of the car park area which showed in greater detail the regiments that had been stationed there.

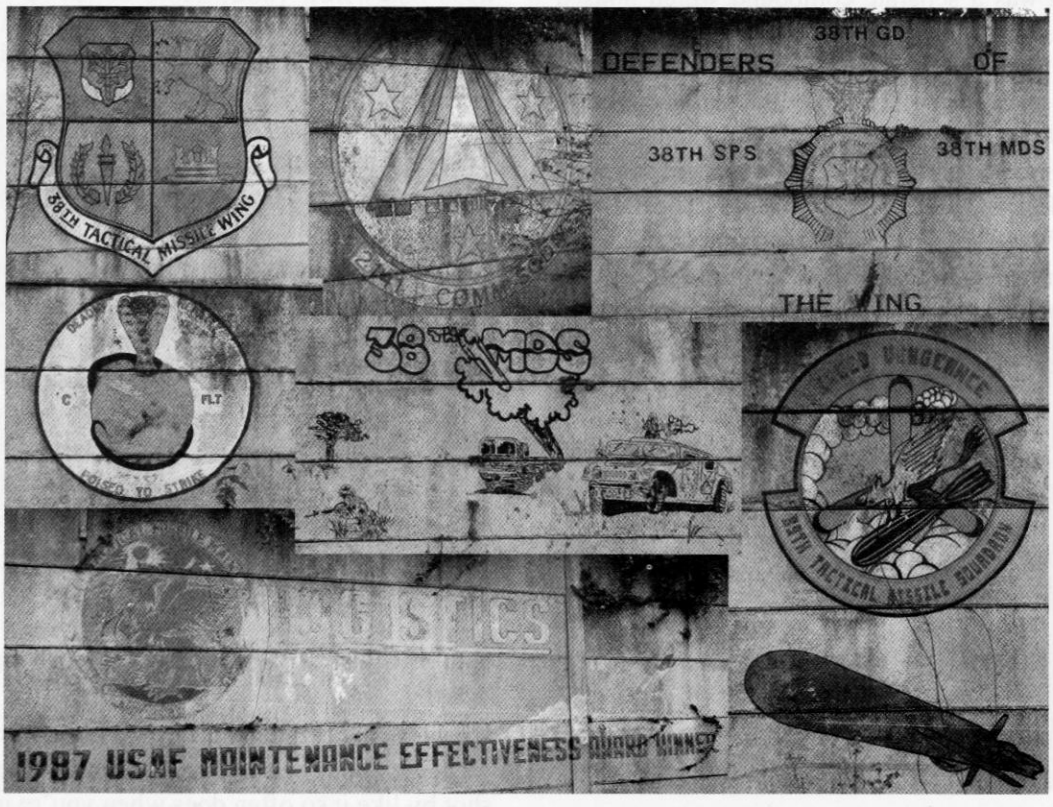
The Alpha Flight Aces and "Bad to the Bone" B-Flight were there again but new were the 38th Tactical Missile Wing, 89th Tactical Missile Squadron, 2141 Comm Squadron, 38th GD Security Police "Defenders of The Wing" and an intact version of the cobra art from earlier, reading "Poised to Strike" C-Flight.



Watchtower in the GAMA area. Photo by Nick Catford.

The light was fading fast now so David and I walked the short distance back to the clubhouse chatting about the place and what changes he'd seen it go through since he first started exploring here. Packed up, we said our goodbyes and thanks and headed back to Hahn airport for a well-earned meal, beer and chat. Huge thanks go to David, his dad Mike and the Bundeswehr who made us so welcome and allowed us to see a very iconic and important site completely at our leisure.

All photos by Tim Robinson, unless noted.



Artwork on the barracks car park wall.

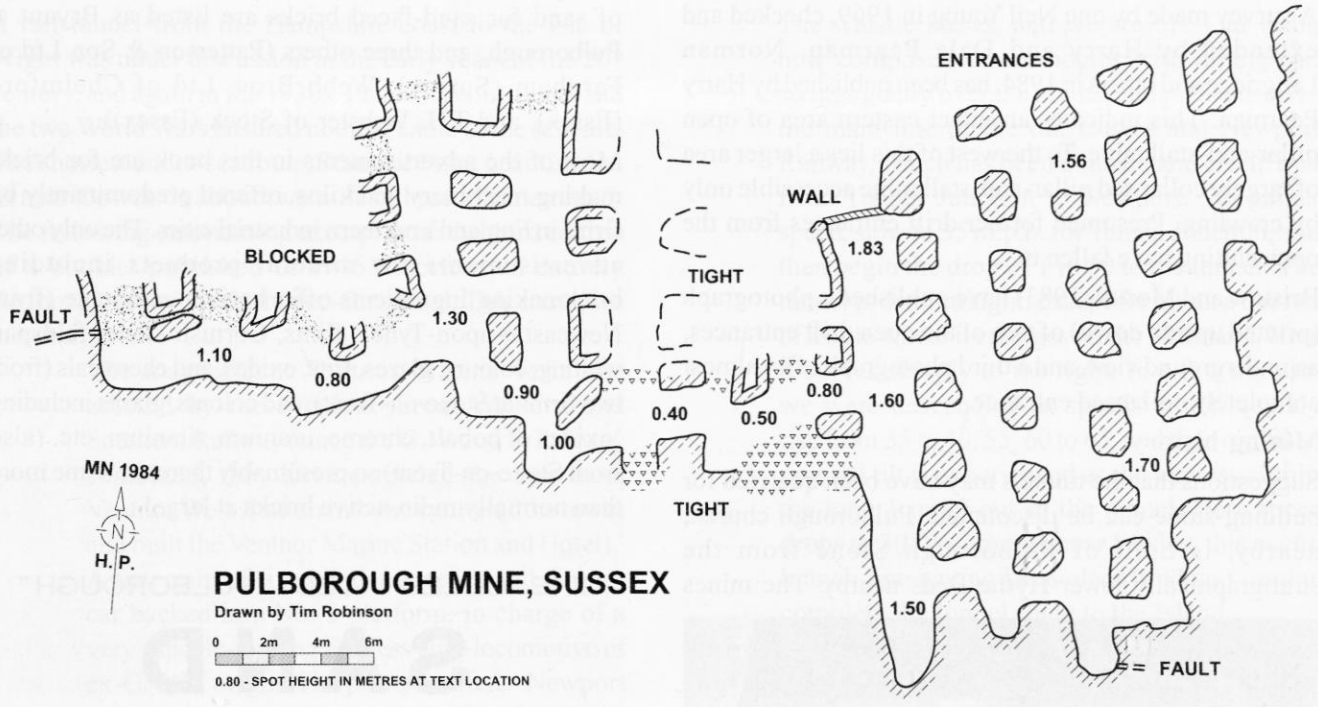
Mare's Hill Moulding-sand Mine, Pulborough, West Sussex

Paul W. Sowan

A small sand mine has long been known at Mare's Hill, near Pulborough, and has been described by Harry Pearman. The galleries barely go beyond daylight. The site is of conservation value on two grounds. Firstly, it preserves an accessible section through the Pulborough Sand Rock and the overlying Marehill Clay (two beds within the Sandgate Beds group of the Lower Greensand). And secondly the mine is an important site for hibernating bats.

Some years ago I attended a site meeting at the mine, with representatives of the West Sussex County Council, Sussex Wildlife Trust, and others. The site is now managed by the Wildlife Trust as a nature reserve. During the course of this meeting there was more or less wild speculation about the original date and purpose of the mine, it even being suggested that the cutting in which it lies is evidence for an ancient trackway, and that the galleries were possibly excavated many centuries ago.

After the meeting, and after lunch, I visited the West Sussex Record Office at Chichester to look at the earliest editions of the Ordnance Survey large-scale plans for Mare's Hill. These make it quite clear that this small industrial site dates only from the first half of the twentieth century. Searching the geological and extractive industries literature soon revealed further detailed information, leading to the conclusion that the Mare's Hill mine was a short-lived operation providing industrial sand for casting or moulding purposes, and for use in brick-making.



Geology

The mine tunnels are driven southwards into the Pulborough Sand Rock, immediately below an iron-cemented bed at the base of the overlying Marehill Clay, these several beds falling within the Sandgate Beds of the Lower Greensand. The iron-cemented bed constitutes the top third of a metre of the sandstone.

Beds of this age but of different mineral compositions have also been exploited economically in Surrey, opencast for Bargate stone (for building) in the west of the county, and both by mining and by open pits for Fullers' Earth at Nutfield in the east.

Kirkaldy (1935) reported on a visit by the Geologists' Association on 7 July 1934. Unfortunately, the published report of this visit says nothing about the purpose or then state of the mine. A photograph, accompanying the report and taken during the excursion, shows the entrances to two of the drifts, apparently flooded. It shows the sand rock, ironstone band, and superimposed clay very clearly, and entirely clear of vegetation.

The Pulborough Sand Rock is described by Bristow and Morter (1983) as an unfossiliferous buff, yellow, or orange fine-grained friable sandstone.

The mine

Five currently open mine entrances at TQ 063 187 lead into down-dip galleries near the east end of the south side of an open cutting, which itself runs eastwards from Broomers Hill Lane. The site is managed by the Sussex Wildlife Trust, and is not open to the public. Visits should not be made without permission from the Trust, and not on any account during the bat hibernation season, October to March.

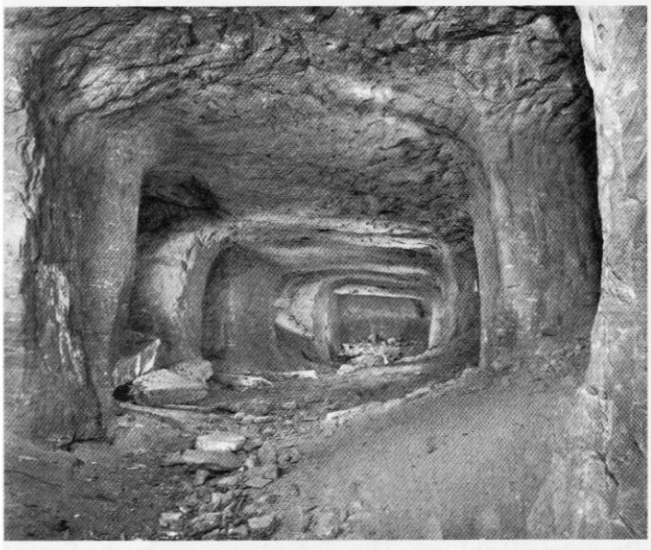
External view to the east in 1987. Note the small thickness of the iron-cemented rock forming a strong roof to the tunnels. Each opening is approx. 2 metres square. Photo by Nick Catford.

A survey made by one Neil Young in 1969, checked and extended by Harry and Dale Pearman, Norman Langridge and others in 1984, has been published by Harry Pearman. This indicates an intact eastern area of open pillar-and-stall mine. To the west of this lies a larger area of largely collapsed pillar-and-stall mine accessible only by crawling. Presumed former drift entrances from the open cutting have fallen in.

Bristow and Morter (1983) have published a photograph (printed upside down) of two of the open drift entrances, an underground view, and a third photograph of an almost completely collapsed entrance.

Mining history

Suggestions that the tunnels may have been quarried for building-stone can be discounted. Pulborough church, nearby, is built of Pulborough Stone from the stratigraphically lower Hythe Beds nearby. The mines do not appear on earlier editions of the Ordnance Survey's large-scale plans, and indeed date only from the earlier part of the twentieth century.



Looking east along one of the galleries. Note the rock bed dips down to the south. The nearly flat ceiling profile reflects the flat lying iron-cemented bed immediately above the mined sand. Floor to ceiling height at this point is approximately 2 metres. Photo by Nick Catford

Martin Snow (2008) notes that Norman Langridge has ascertained from local residents that the mine was 'active in 1918', worked by a contractor named Perrier and a sand-digger called Tom Nickham. The sand, he was told, was sent to the Midlands by train from Pulborough Station (about 2.5 kilometres away by road) for use as moulding-sand for making iron castings. This use is confirmed by Bristow and Morter (1983), probably from British Geological Survey records.

In 1931 one F.G. Bryant advertised his 'Celebrated "Pulborough" sand for bricks, tiles, etc., red, multi, rustic effects etc.' This advertisement appeared in the third edition of Searle's *Modern brickmaking*, and offered 'sands for all purposes' and directed readers' attention to Searle's Chapter XII, on facing bricks, where suppliers of sand for sand-faced bricks are listed as Bryant at Pulborough, and three others (Patterson & Son Ltd of Farnham (Surrey), Webb Bros. Ltd of Chelmford (Essex), and T.H. Webster of Stock (Essex)).

Most of the advertisements in this book are for brick-making machinery and kilns, offered predominantly by firms in England's northern industrial cities. The only other advertisements for mineral products including brickmaking ingredients offer barium carbonate (from Newcastle-upon-Tyne); flints, Cornish stone, feldspar, whiting, colours, glazes, frits, oxides, and chemicals (from two firms at Stoke-on-Trent); and colours, glazes including 'oxides of cobalt, chrome, uranium, titanium, etc. (also from Stoke-on-Trent) so presumably there are some more than normally radio-active bricks at large!

Advertisement from A.B. Searle's *Modern brickmaking* (3rd edition, 1931)

F.G. Bryant Ltd placed an almost identical advertisement in the fourth edition of *Modern brickmaking* in 1956, adding that they could supply 'sands for all moulding purposes'. Although three other firms advertised barium carbonate and various colourings for ceramic products, there are no rival sand suppliers.

Secondary uses

Martin Snow (2008) has reported on investigations locally by Norman Langridge, who learned from local people that the mine was 'derelict' by 1946 / 1947, although this seems to conflict with Bryant's advertisement some ten years later! It was, reportedly, taken over by one Colonel Nichols who used it for growing mushrooms until a roof-fall led to his abandoning the enterprise.

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The projected Solent railway tunnel to link Hampshire to the Isle of Wight

By Paul W. Sowan

A rail tunnel from the Hampshire coast to the Isle of Wight was under discussion in the early years of the 20th century, and again in the 1930s. Financial constraints and the two World Wars ensured nothing came of the scheme. The shortest under-sea route, Stansore Point near Calshot to near Cowes, is about two miles (three kilometres).

The following entertaining excerpt from the third edition of a booklet published in 1946 describes an entirely fictional journey via the hoped-for tunnel. This starts, we are told, at ..

> 'the magnificent Ventnor Marine Terminus erected by the London, Great Western and Southern Railway (since the G.W. and S. Railway combined, they have extended the line from Ventnor West Station into the centre of the town, and built the Ventnor Marine Station and Hotel).'
>
> A fine train of six corridor coaches and dining-car backed into No. 3 platform, in charge of a very capable-looking Express tank-locomotive of ex-G.W.R. origin. The porters called, "Newport and London only. Fast train to Waterloo." We take our seats, and, after admiring the lovely scenery past St. Lawrence, settle down.
>
> Eventually, we pull up at Newport (Central), after a smart run of 22 minutes. Here the tank-locomotive is detached, and through carriages from Freshwater and Sandown are attached to the rear of the train. As we looked, a long, wicked-looking streamlined electric Express locomotive backed onto our train. She looked like a monster from another world. She was painted (like the rest of the train) in the handsome purple-lake livery of the L.G.W. and S.R. Co., and was built for speed – and looked it.
>
> The whistle blows, and we are off. Our train, now composed of ten bogies with dining-car, swings gently over the points, and pulls out on to the main line of the old Cowes and Newport Railway, which has been doubled and electrified from Tunnel Junction to Newport. We gather speed, slow to 35 m.p.h. for Tunnel Junction, and then begin the drop of 1 in 80 to the tunnel. The tunnel is dead straight, except for about a quarter of a mile where it emerges on the Mainland. Here it curves sharply to the right. In a few minutes we were descending at speeds which quickly rise from 35 to 40, 55, 60 to 65; and then a gradual upward tilt is experienced as the express climbs the long 1 in 80 out of the tunnel. Here speed drops to 30. We emerge near Fawley, this useful branch line having been electrified and used to complete the tunnel route to the Island.

The use of the word 'wicked' to mean excellent, remarkable, or splendid, is an Americanism first recorded by the Oxford English Dictionary as being in use in this sense by 1920.

The journey continues, with speeds up to 103 m.p.h., non-stop to London Waterloo.

The populations of Ventnor and Newport were reportedly 6,410 and 19,482 in a 1960s edition of Chambers' *Encylopaedia*. The seaside resort had two terminal stations. Ventnor West on the Isle of Wight Central Railway (closed in 1952) had direct trains to Newport. Ventnor on the Isle of Wight Railway (closed in 1966) would have been the station mostly used by rail travellers to London, the route running via Sandown, Ryde, and the ferry to Portsmouth. The Ryde - Shanklin route (now electrified and operated using secondhand London Underground rolling stock) is the only Island Line still carrying passengers, other than a short preserved tourist line at Havenstreet.

SOURCE: TURTON, Fred, 1946, *The history of the Solent Tunnel Scheme and railways associated with it, etc.: a book for the railway historian. 3rd edn*. Cowes: Stanley Wroath: 59pp.

Berry Bros & Rudd Cellars and Possible Ice-Storage Pit, St. James's Street, London

Paul W. Sowan

On Wednesday morning, 29 April 2009, thanks to arrangements by David Ferris and Stewart Wild, a small group gathered in this distinctly upmarket wine merchant's premises at the bottom of St James's Street, within site of St James's Palace, this being the local corner shop for royalty!

Our thanks also to Lance Armstrong of Berry Bros & Rudd for facilitating this visit and guiding us so expertly.

Development of this part of the West End was planned, if not started, before the fire of 1666 by the Earl of St Albans [Henry Jermyn until 1660], who died in 1684. He had been granted the then open land in 1665. Nine ratepayers were recorded in St James's Street in 1663, and 28 in 1671. Pickering Place (London's smallest public square), adjoining Berry Bros & Rudd, is surrounded by properties erected in 1731.

Berry Bros & Rudd

The antique frontage of this establishment features a coffee-mill, indicating the firm's seventeenth-century origins as tea and coffee merchants. Immediately inside we found a very large and venerable pair of scales: it seems the firm was once in the habit of recording its customers' weights, although why this is done is not clear! Ledgers containing these records are still displayed. A very modern computer screen was tastefully incorporated into the polished wood furnishings! After a short introductory talk by our guide, and a tour of the historic upstairs rooms, we were conducted below the ground floor level, to tour the cellars.

Cellar set up for corporate dining

The cellars

These cellars were until recently London's most extensive wine cellars, and used to house the firm's stocks of wine and spirits, a function now largely relocated to Basingstoke. The space has now been adapted in large part for the accommodation of training and tasting sessions and as a venue for exclusive lunch or dinner parties. Great care has been taken to retain and show to advantage original features such as the brick floors and vaulting.

A small area still functions as a cellar and despatch department for local deliveries. We thought this an admirable location for our Sub Brit Committee meetings, but hesitated to ask about the room hire rates!

There are cellars on two levels below the premises and, in small part, the street. Their footprints do not exactly coincide.

An enigma

In the floor of the upper cellar there is a cylindrical brick-lined pit, supposedly an ice-house or a well, of the order of three metres in diameter, and at present about as deep. This is lit, and covered by a glass floor, allowing it to be viewed by visitors. We were informed that this pit had been discovered during the recent refurbishment of the cellars, excavated to the depth now seen, and retained as a feature of interest. This pit had been filled with 'rubbish' but not excavated to the bottom, so its total depth is unknown. So far as we were told, the material removed had not been archaeologically examined. The ice-house and well interpretations are considered below.

Part of the cellar used for wine appreciation classes

Geology

There being no natural or even man-made exposures of the sub-soil in St James's, the whole district having been covered by buildings and pavements for several centuries, our knowledge of what exactly lies under St James's Street has to depend on published well records, or on privately-commissioned site investigation reports for the developers of new buildings, or on recorded observations in temporary exposures such as sewer trenches and foundation trenches.

The only readily accessible option is well records, collected and published by the Geological Survey. From these, such as recorded by Whitaker, we can derive a

partial view of just what the buildings in this district are standing on. At White's Club, for example, a well sunk in or before 1822 reached a depth of 235 feet, of which 142 feet were London clay, and 93 feet the underlying Reading Beds Clay.

Neither of these formations is likely to have yielded much water, although water ultimately rose to a level 45 feet below the street: this water most likely came from surface drainage. At Walsingham House, on the corner of Arlington Street, over 20 feet of made ground and gravel was recorded.

To find a large yield of water, wells deep enough to pass right through the London and Reading Clays, at least as far down as the permeable Lower London Tertiary bed and underlying Upper Chalk are needed. Several have been sunk in the district.

An ice-house?

The enigmatic pit, as seen, certainly appears to have the dimensions and proportions expected of an ice-house. Beamon and Roaf (1990) confirm that ice-storage pits in urban cellars are well known.

An ice-house necessarily has a drain, to carry away water resulting from a part of its contents melting, or at least have its lowest part sited in the sort of soil, such as loose sand or gravel, into which such meltwater could percolate via apertures in the lining left for that purpose. Ice surrounded by cold air at 0°C will last longer than ice surrounded by meltwater at the same temperature, air being a better insulator than water.

Cobbet (1822) noted that:

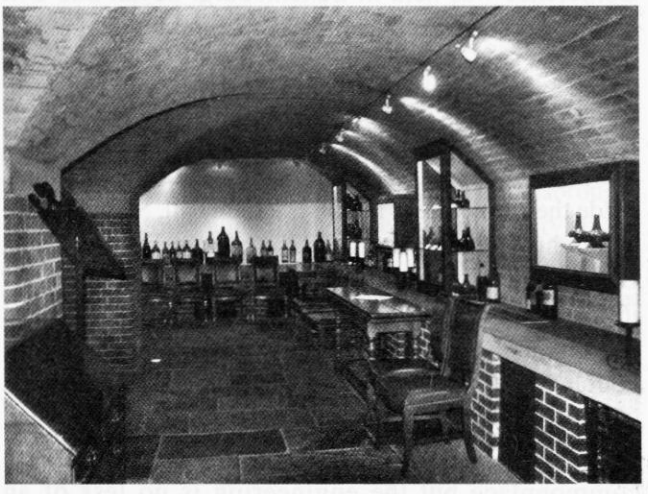
> Ice-houses should therefore be, in all their parts, as dry as possible: and they should be so constructed, and the ice so deposited in them, as to ensure the running away of meltings as quickly as possible, whenever such meltings come ... there must be something that will not suffer the water, proceeding from any melting, to remain an instant.

Beamon and Roaf (1990) recorded, from documentary and archaeological sources, evidence for at least five ice-storage sites dating from the 17th and 18th centuries in and around the St James's district.

Colvin et al (1976) discussed a record of the construction of a 'snow well' in 1666–67 at St James's Palace that had been 'built for the duke "in the field by Berksheire garden nere St James's"' at a cost of £84. It was 24 feet deep and 20 feet wide, and was sited in such a way that the melted snow drained into the horse-pond in the stable-yard of the palace.'

In a footnote, discussing the original documentary record, it is added that there are two duplicate records for the creation of this 'snow well'. One is headed 'a snow well for his Majestie'; the other 'a snow well for his Highness the Duke of York'.

It is concluded that in view of its proximity to the latter's lodgings at St James's it was presumably built for his benefit. In 1668–9 a new well [presumably also for snow] 19 feet deep and 19 ° feet in diameter at the top was built, and the old one was reconstructed after its thatched roof had been burnt. The remains of a seventeenth-century ice-house were discovered in this vicinity in 1936, reported in *The Times* of 19 September that year.



Area used for wine-tasting events

A water well?

There are two classes of wells in this part of central London, tapping water from distinct aquifers at different depths. Wells such as may have been sunk on the premises (indeed apparently within the building) for domestic purposes during the nineteenth century or earlier would generally have been shallow draw-wells. These would have been worked by hand-raised buckets or (if the well were under 30 feet deep) by simple lift pumps. The water would have come from waterlogged permeable ground, such as sand or gravel, overlying London Clay below the premises. It might well, in a densely built-up area before the installation of main drainage, have been more or less contaminated.

For larger supplies, a deep well would have been necessary, worked by engine-driven force pumps (or very strong men with large buckets on very long (and heavy) ropes, working flat out!). In central London, wells such as these pass right through the superficial deposits, then through several hundred feet of London Clay and other Lower London Tertiary strata, to tap the chalk aquifer.

Conclusions concerning the pit

The diameter of the pit is consistent with its having been an ice-storage pit, and seems far too great for it to have been a domestic water well. Several early ice-houses, ice-pits, or ice-wells are known in this part of London. Some seem to have stood in the open, with thatched or other roofs; while others were made within buildings. It may be assumed that they are based in free-draining permeable soils such as sand or gravel, above the water-table held up by the underlying London Clay.

"De-Luxe – the Delights of Luxembourg"

For many years, Sub Brit has enjoyed a close relationship with SFES – the Société Française d'Etude des Souterrains. Just like Subterranea Britannica, this French Underground Society's interests extend outside their home country and in October 2009, their Annual Conference was held in Luxembourg. Seven Sub Brit members had booked to attend this International event. We were to be away for seven days so, spotting the symmetry, we agreed to write up a day of our trip each.

Day 1 & Introduction *by Martin Dixon*

Starting at a ridiculously early hour, six of the members made their way by car in "SB1" (John Lill, Stewart Wild and John Burgess) and "SB2" (Martin Dixon, Linda Bartlett and David Ferris) to the Channel Tunnel terminal in Folkestone. Paul Sowan, with more regard for his carbon footprint, would travel by train all the way. A few double espressos while waiting for our departure helped us plan our route across France to the Conference venue.

Travelling under the Channel has now become commonplace but the engineering is no less of an achievement. As usual we hoped to experience a mid-channel evacuation, but also as usual, we were disappointed. On emerging in France, we drove for an hour or so on motorways and had a pleasant picnic. SB1 took the lead and navigated – a combination of SatNav and StewNav. The former was to prove more reliable but the latter more scenic.

Sedan

We then headed cross country on a former Roman Road ('Voie Romain') towards our overnight stop at Sedan. The only memorable traffic was an enormous (150 feet long?) pair of trailers carrying blades for more French wind farms. Luckily the road where we met wasn't very windy (pun intended!).

Sedan is a moderately sized town, dominated by its Citadel of which more anon. It is situated on a bend in the navigable Meuse (as in "Sedan, you're rocking the boat"). We stayed in the Hotel Saint Michel which is tucked away down a one-way street but had the convenience of courtyard parking, accessed via a passage a couple of inches wider than a modern car. We popped our noses into the Hotel's vaulted cellars but the Channel Tunnel aside, this was our only underground site of the day. After a short stroll up to the Citadel to orient ourselves we ate in the hotel restaurant – a first-rate three course meal.

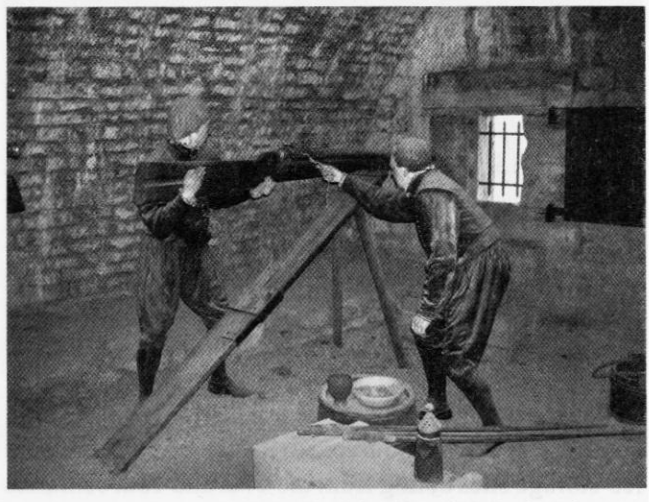
Day 2 Sedan to Luxembourg *by John Lill*

After a sound night's sleep (having remembered earplugs to counter Stewart's snoring!), we were up in good time. After a comprehensive breakfast buffet up on the 4th floor we wandered round Sedan to allow the tourist office to open at 10.00am. We learnt from here that the town flourished as a cloth-manufacturing centre in the 16th and 17th centuries; first under its Princes and later under the French King Louis XIV. Textiles continue to be manufactured in Sedan and the vicinity. We had a feeling that Sedan Chairs also came from here, but we couldn't substantiate that story and the Tourist Office staff gave us a Gallic shrug.

Sedan Castle

Our main visit today was Sedan Castle, built in the 1420s by a rich German lord Evrard de la Marck; it is claimed to be the largest fortified medieval castle in Europe. We enjoyed an excellent self-guided tour over seven levels, starting at the top and working our way down. The complex has a total area of 30,000 square metres and is the only remaining part of the once enormous fortifications in and around the town.

There is lots to see here, and the tour is comprehensive, allowing you to enter into many of the fortifications including the gatehouses, look through many firing slots and see the views from the top of the bastions – four of these were added at a later date as the defences were constantly improved over the years, although one of these has disappeared as the French practised and succeeded in using explosives to demolish it.



Musket gallery in Sedan Citadel. Photo by Martin Dixon

Sedan was the scene of a French military disaster in 1870 during the Franco-German War – this is commemorated in displays in one of the last rooms on the tour. Most of the 17th and 18th-century houses in the centre of the town were destroyed during the German invasion of France in 1940 during World War II.

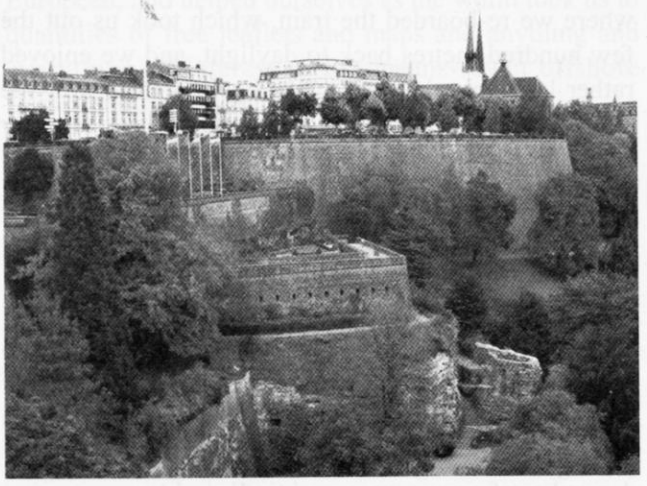
As with all good French tourist attractions, the visit ends in the shop and a bar, so we felt obliged to have a small refreshment. This was after we had discovered the last and lowest part of the visit – we were able to peer into an underground cistern which may have been used as an oubliette.

We stuck our noses into the part of the castle that has been converted into a 3-star hotel with 54 rooms – looks lovely for a future visit. Now it was time for lunch and we found a micro brewery adjacent to the castle. Some of us ate their speciality which was 'Flammekueche' – a dish from the Alsace region, like a thin pizza with various toppings; others had the set menu of the day.

Into the Grand Duchy

Leaving Sedan, we then travelled via the Ardennes forest with some splendid scenery and views once over the Belgian border. Having for once agreed a headlamp-flashing code (one = 'this is me', two = 'stop when convenient' and three = 'emergency STOP NOW!') we successfully refuelled SB2 without losing touch with SB1. Over another border took us to Luxembourg where we easily found our hotel – a modern IBIS in Livange, about 10 kilometres south of Luxembourg City. Fittingly, Stewart and I were allocated Room 208 – the former frequency of Radio Luxembourg! Less fittingly, this was only after being offered a double rather than a twin room.

Our 7th member, Paul Sowan, started his journey today by Eurostar train from St. Pancras to Brussels, and then on to Luxembourg City. The journey includes numerous tunnels in the 115 kilometres on the English side of the Channel Tunnel, but only a single tunnel (under central Brussels) in something like twice as far through parts of France, Belgium, and the Grand Duchy.



Casemates of the Petrusse valley in Luxembourg.
Photo by Martin Dixon

In Luxembourg, Paul took time to admire the dramatic city-centre gorges of the rivers Pétrusse and Alzette and revisited the superb Musée d'Histoire de la Ville de Luxembourg, a spectacular construction partly built into the cliff face of the Alzette gorge. The very large glass-floored lift serving all five storeys is quite an experience. The Pétrusse Casemates, sadly, had closed for the winter at the end of September; and the Bock Casemates have been closed throughout 2009 for renovation.

So, we all met up at the IBIS hotel - even in time for 'happy hour' before we had a very acceptable dinner in the hotel.

Day 3 The first day of the SFES congress *by Paul Sowan*

Luxembourg

The Grand Duchy of Luxembourg, with an area of 2586 square kilometres (998 square miles), is about the size of Derbyshire. It is larger than several other European states such as Andorra, Liechtenstein, Monaco, and Vatican City. The population is of the order of 455,000, of whom 88,000 live in Luxembourg Ville, the capital. Another 50,000 live in the immediate area. The second-largest town, Esch-sur-Alzette, has 30,000 inhabitants and another 10,000 nearby. It is the 'capital' of the iron-mining and steel-making district in the south of the country, and described as Luxembourg's equivalent of Middlesbrough. Every other town and city in Luxembourg is very small.

The north of the country is composed of folded Devonian rocks, with an average elevation of 1300 to 1600 feet above sea-level. The lower land in the south, averaging around 900 feet above sea level, is of flat-lying sedimentary rocks of Triassic and Jurassic age. And the extreme south-west of this lower terrain, where the Congress was based, is an area known as the Terre Rouge (the red lands) forming a very small part of the Lorraine ironstone orefield. Dolomite (a magnesian limestone) and gypsum have also been mined, as well as iron ore.

Battery-powered train used for tourist trip into the National Museum of Ironstone Mining at Rumelange. Photo by John Lill

The Musée National des Mines de Fer Luxembourgeoises

(National Museum of Ironstone Mining of Luxembourg) at Rumelange

The members of the Conference assembled at the Museum's quite elegant brasserie for an 08.00am start, and found ourselves being served a very nice continental breakfast of coffee and croissants to start the day.

In the adjoining museum grounds we boarded a little train, very similar to the one that took the miners into and out of the mine before it closed in 1981. This battery-operated vehicle trundled very bumpily away from a clearly visible mine portal, along a now well-vegetated route, and after

Iron in Luxembourg, the Lorraine ironstone field and minette

Modern industrial-scale exploitation of the Middle Jurassic sedimentary ironstones in Luxembourg commenced in the mid-19th century. The orefield extends into neighbouring Lorraine, in France, with only a very small part of it in the Grand Duchy. The mines at and around Rumelange had the advantage that the beds of sedimentary ore outcrop at the surface, and extend to no great depth. This made it easy for them to be worked opencast, and by drift mining, and in a few cases via relatively shallow vertical shafts. Further south, the ore has to be deep-mined, as the ore-bearing beds dip in that direction.

The material mined, called in France and Luxembourg 'minette', is a relatively lean ore containing (as well as iron III oxide) quantities of sand (silicon dioxide) and limestone (calcium carbonate) and some clay (aluminium &c silicates).

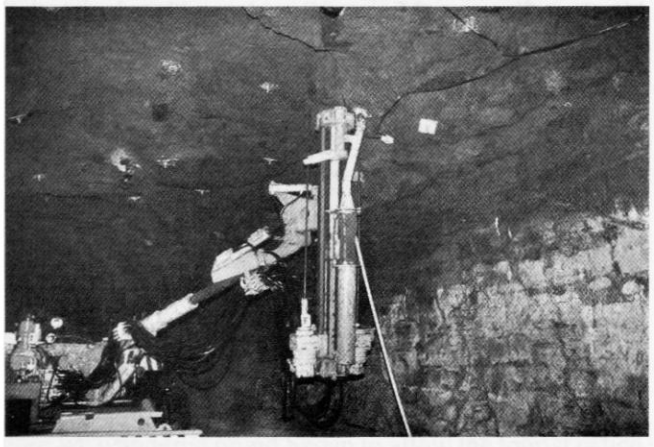
A retired mining engineer explained that 'minette' is a diminutive of 'mine', the latter word meaning in this context (as also historically in English) the ore worked rather than the place from which it was dug. The Luxembourg minette as mined contained about 30% iron, whereas pure haematite has 70%. A high phosphorus content made the ore difficult to smelt satisfactorily until the introduction from Britain of what was described to us as the 'Thomas-Gilchrist' process in 1876. This refers to Sidney Gilchrist Thomas [1850 – 1885], a metallurgist who discovered a method for eliminating phosphorus from pig iron using the Bessemer converter in 1875. Sir Henry Bessemer [1813 – 1898] introduced the principle of his 'converter' in 1856.

Luxembourg has no coal resources of its own, this essential for the iron and steel industry being imported by rail, variously, from Belgium, the Netherlands, or Germany.

Rumelange had 710 miners at work in 1934, extracting in that year 1,020,982 tonnes of ore. The last of three blast furnaces here closed down in 1919, ore thereafter being sent by cableway or rail to nearby Esch-sur-Alzette for smelting.

At Esch-sur-Alzette heavy industry continues, although the iron and steel business is now concerned largely with recycling metal using electric furnaces.

a short while plunged us into darkness as it entered the mine via a back entrance. We traversed some hundreds of metres of underground track, passing on the way other tunnels (some also with track laid in them) and assorted items of mining machinery and rolling-stock, eventually halting at a platform. From here, we followed our guide on foot, pausing to view and have explained to us (in French) tableaux illustrating earlier and modern mining methods, and a great deal more heavy machinery. One section on the wall is labelled identifying the numerous contrasting beds of ironstone and calcareous and siliceous beds extracted. At Rumelange a total thickness of 13 metres of beds were mined. At one point we descended a short flight of steps to a lower working level, viewing more of the same, before walking back to the platform where we re-boarded the train, which took us out the few hundred metres back to daylight, and we enjoyed rather less time than we might have liked to tour the grounds, the museum, and the shop. Today's reporter found time only to buy several books at the shop.



Drilling rig for rock-bolting in Rumelange Ironstone Mine.
Photo by John van Schaik

The contact details for the Museum are: National Mining Museum, Carreau de la Mine Walert, L-3714 RUMELANGE, Luxembourg / www.mnm.lu

The Congress

After the museum visit, we walked the short distance to the Cultural Centre in the town for the formal start of the Congress. Here, to my delight, there were more books to buy!

A number of papers were read (in French) commencing with one addressing the history of ironstone mining, iron smelting, and steel production. We were grateful, as ever, to Luc Stevens (President of SFES) for providing English translations of the French abstracts included in the Congress documents. And of course David Ferris and Stewart Wild were on hand to translate as well. There was also a presentation on the gigantic fossil belemnites (extinct relatives of the octopus and the nautilus) for the fossil remains of which the district is noted.

The Congress lunches proved less than comprehensive for us vegetarians, but were evidently much appreciated by everybody else! Evening meals, in restaurants, were less problematic, as veggie nosh could be negotiated!

Schengen. Three countries (Luxembourg, France and Germany) meet in the river adjacent to the wood on the lock island. Photo by Martin Dixon

Schengen

Our afternoon excursion was to the village of Schengen. This is a very small village in Luxembourg on the wide Moselle river, bordering France and German and was made famous by an agreement relating to 'open borders' throughout mainland Europe. Anybody who has run the obstacle course to enter or leave the United Kingdom will know that we are not party to the Schengen Agreement! The document was signed on a boat moored in the Moselle where the three international borders meet.

We first inspected the European Union's Centre Européen, and helped ourselves as the whim took us to quantities of free leaflets and maps and anything and everything of interest to Europeans (even offshore Europeans such as ourselves!).

The Strombierg gypsum mines

The second point of interest in Schengen, and our more important goal here, was the substantial hill which was once the scene of intensive gypsum mining and, it seems, also some small-scale dolomite mining.

The mines have all now collapsed. We viewed one or two dramatically fallen-in drift entrances and, on top of the hill, the impressive craters and fissures resulting from the falling-in of the mine galleries below. Our understanding of this fascinating site was greatly enhanced by a series of superbly executed and informative display boards around a walking trail. These are in French and German, and include a plan of the former mines. There was also available for us a free guidebook, containing much the same information. The trail offered a very pleasant woodland walk, with splendid views up and down the Moselle, and good healthy exercise up and down some rather steep paths and flights of steps.

The caves of Domaine Henri Ruppert

And finally, the location seemed a very good opportunity to visit the local 'caves', the word here in French of course meaning 'cellars' rather than caves in the English sense, and to enjoy a wine tasting. The fact that the 'cellars' of Domaine Henri Ruppert are modern, and built above ground on a hillslope above the village, did nothing to detract from our enjoyment of several glasses of most acceptable white wines, as we watched a spectacular moonrise above the vineyards in the next country.

The day ended with a formally presented and served dinner, and good conversation, at the restaurant at a local Youth Hostel (in no way resembling any of our recollections of British youth hostels' members' kitchens in our younger days!).

Day 4 Our second day at the Conference *by John Burgess*

The conference session was again held at the Cultural Centre in Rumelange and began with a talk entitled "Sante et Securité" - which sounds far better than what we call "Elf'n'Safety"! It covered the history of the subject with regard to the mines in Luxembourg and was indeed interesting.

Following Sub Brit's trips to France in the past, the next session about the underground quarries in the Paris basin was of great relevance. However, at the end of the talk, Frederick Willmann asked the longest question I have ever heard, lasting a good five or ten minutes. Indeed, I actually left the room, went downstairs and back again - and he was still talking! What I hoped was that the lecturer would give him a one-word answer, 'non'! *[In fact it turned out that Fred was playing for time – allowing his colleague Hugues, to finish preparing the talk they gave next!]*

Frederick and his colleague, Hugues Dewerdt then gave us their presentation on some of the resently discovered Muches (underground 'villages') in the area of Cambrai. Sub Brit have visited many Muches in Northern France on our trips there, but not these ones. Two of the sites were rediscovered with the help of German WWI plans. Then there was a closed session for the AGM for SFES; and so we adjourned to the nearby Mining Museum to take some photos and then back to the brasserie for a coffee.

After a Chinese buffet lunch we were collected by a coach to take us into the City of Luxembourg. On the way we were very lucky to see a number of the very distinctive livestock that are a feature of Benelux, namely the Luxembourg Brown Ear sheep.

Luxembourg City

One of the most distinctive features of the City of Luxembourg is the ravine that forms a natural defensive line around the old part of the City. This is called the Petrusse Valley and it is soon clear that the sandstone cliffs are perforated with many openings which communicate with tunnels and sets of staircases within, all part of the military defence works of this 'Gibraltar of the North'

We descended into the valley in true Sub Brit style by way of what looked like some cellar steps below a substantial building. We went down damp, dimly lit, low, narrow tunnels and staircases within the cliff face which linked the various levels of casemates and countermine galleries of Bastion Beck.

Emerging into the light of day again, we moved along the floor of the gorge for about a quarter of a mile to visit the underground chapel of Saint-Quirin which is carved into the side of the cliff. Retracing our steps along the footpath, under the curious gaze of strolling, jogging, and cycling Luxembourgers, we came to an anonymous green steel door on the opposite side of the cliff.

A walk right under the city

Then came that moment that epitomises the joy of being in Subterranea Britannica - the man with the key! Our guide came forward, unlocked the door and in we went. There in front of us was a vast tunnel which runs for nine hundred metres, or around a thousand yards in real money! It was about 3.5 metres high and 5 metres wide.

Entrance stairs to storm drain and Cold War shelter beneath Luxembourg City. Photo by John van Schaik

The tunnel was constructed at vast expense during the Cold War period, probably originally as a storm drain, but large enough (too large!) for a nuclear shelter. As in some of the tunnels under the streets of Paris, there are signs every so often to tell you which part of the city is above at that point. According to our guide, the construction cost was so great that any future expansion or extensions in the form of shelters or bunkers never materialised. Indeed so great was the embarrassment that no formal proposals or other documents relating to the tunnel can be found. Anyway, it is still an amazing place and emerges literally on the far side of the City, at the base of a cliff near the Vauban Towers. After a short film show about the Vauban fortifications, we then piled back into the bus back to Rumelange.

Dinner that evening was again pleasant – this time in the little Brasserie attached to the Mining Museum – the French are certainly good at entertaining!

Day 5 Visits in Walferdange *by Linda Bartlett*

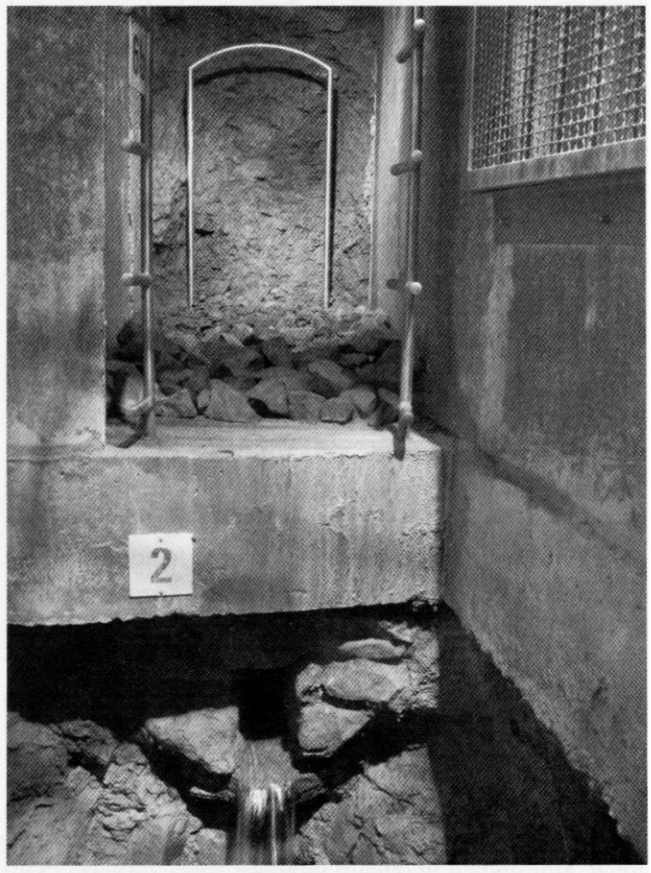
Our conference today was hosted in Walferdange, a small town about 5 miles north of Luxembourg City. As lectures started at 9.00am, we had an early start after a splendiferous sunrise, to catch the coach from our previous base in Rumelange. A spacious, modern room greeted us, with good projection facilities – but alas, no coffee!

We had five lectures this morning – the first was by Paul Sowan. This time we could understand it all, and the SFES president, Luc Stevens did the translating for the rest of the audience. Paul talked about Chalk Mining in the UK and in Europe, comparing and contrasting the styles and types of mines and excavations; he was able to show some shots of the tunnels beneath Dover, taken during our recent Study Weekend there.

Next was an entertaining slot by Professor Olivier Francis, talking about the Gypsum Mine just up the road and its current use as an Underground Laboratory for Geodynamics. It houses unbelievably sensitive instruments used to measure seismic and gravitational activity of the earth – such as the changes which happen during earthquakes. This was particularly interesting as we paid a visit to the lab in the afternoon.

Saved by coffee

By now it was about 10.00am and we heard the welcome clink of coffee cups being wheeled along on a trolley, along with some excellent pastries.

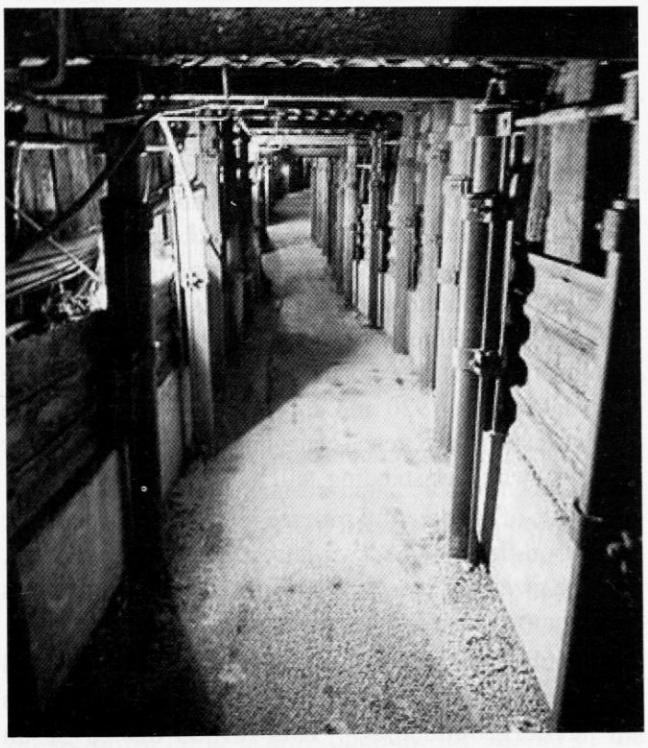


Original Roman conduit water channel, now pouring into geological fault. Photo by Martin Dixon

Refreshed and fully awake after the usual strong coffee, we listened to Guy Waringo explaining another local feature – a Roman 'Qanat'. This is an underground aqueduct or conduit, apparently taking water to a Roman villa on the outskirts of Walferdange (the villa no longer exists). It is termed a Qanat as it is similar to those constructed in the Middle East. The conduit, which still carries a good flow of water today, is some 600m long, and passes through a low hill. The surprising feature is series of some 25 – 30 wells or shafts along the length of the canal, each about 20m apart from the next. The reason for these is debatable – there are two strong options. The first is that they were for construction purposes, the other is that they were used to feed additional groundwater into the conduit. They range in depth from 10 to 37m, some beautifully lined in cut stone. They have been excavated and preserved by the local group, and many have been capped to assist preservation. There are two shafts which you can look down – but I'm getting ahead of myself here as we visited the site in the afternoon.

The final two lectures of the conference were by colleagues from Italy; the first, by Claudia Chiappino (in English again!) was about the rock-cut dwellings in Cappadocia and other sites in Turkey. Myself, David and Martin had visited this area in April 2008 (see *Subterranea* 18) so it was great to see that other people were excited by this amazing troglodytic region. There are opportunities to visit again with this group.

And finally for the morning, Giulio Cappa talked about a site in Italy which he had been exploring, after a visit by SFES last year. Giulio talks regularly at the SFES conferences, and it was amusing to hear about his latest project, even if it was a bit difficult to grasp the finer details!



Shored entrance gallery in Walferdange Gypsum Mine. Photo by John van Schaik

Next on the agenda was lunch, but the conference organisers seemed a bit vague about the precise nature, so we began to get a bit worried until we discovered Denis Montagne raiding the kitchen (legitimately, as it turns out) to provide large platters of cold meats & salamis, cheeses, and salads. There was another panic when no bread could be found, but again that was soon rectified. There was enough left over to feed a small army – but we enjoyed our impromptu picnic immensely. Despite the rain, a few of our group dashed over the road for a digestif.

Underground in Walferdange

We had two splendid visits in the afternoon, transported by coach. Luckily, as it was still pouring with rain, the first one was truly underground in the Gypsum Mine. We had an extensive tour, looking at many of Olivier's seismic instruments. The most sensitive of these could measure movements as small as 10^{-11} metres. It was very kind that he let us into so much of the mine with special breeze-block stores for his instruments and his little workshops, protected by plastic sheets from the dust in the mine.

Seismology instruments in underground laboratory, disused gypsum mine in Walferdange. Photo by Martin Dixon

Our final visit was the best of the lot for me, being interested in all things Roman as well as all things underground, and despite the fact that it only had a small underground part. We went to see the Roman 'Qanat', both the conduit and the wells. The downside to the visit was that it continued pouring with rain for our hour and a half walk through the woods, and we were not very well equipped with rain gear, so got soaked! But what we saw made up for it. We were able to see the position of about 10 of the wells (or shafts) – most of them capped with heavy lids. Two had been left accessible so you could peer inside, and our guide opened these for us to look in. They were lit, so we could see the beautifully carved and constructed stone linings. Then the exciting

bit – the local group have made an entrance into the hillside to see the conduit itself and the base of one of the shafts. Here you can see the construction of the qanat, about a metre high, with a nicely lined floor with the water gurgling in the channel underneath. Because of a geological fault some centuries ago, the qanat is interrupted at this point, so the water has been channelled out to the surface here – spilling into a recently constructed pool.

Back in the coach and back to Rumelange for our final dinner (luckily I had a change of clothes in the car, so didn't have to sit through the dinner in soaking wet clothes). We were in an Italian restaurant, in Luxembourg, with English, French, Italian and Dutch people – enjoying a delicious dinner of steak in a wild mushroom sauce, followed by the best chocolate pudding I have ever had.

Day 6 Livange to Verdun *by Stewart J Wild*

Homeward bound

After breakfast and check-out, SB1 and SB2 departed the hotel in convoy, stopping at the nearby railway station to drop off Paul, who prefers to travel everywhere by train.

Paul tells us that as it was raining, on and off, most of the day, he opted to spend the day riding around this very scenic country on the railway system. In Luxembourg he crossed the spectacular Alzette gorge in the city centre no fewer than three times within a kilometre or two, offering some of the best views of the Bock casemates and other fortifications. After Mersch, the next train took him onto a German (DB) single-decker bound for Trier and on to the frontier station at Wasserbillig on the Moselle. On the next leg to Clervaux he traversed by far the most attractive scenery in Luxembourg. Two more local trains and then back onto the Eurostar, via Liège, through the Belgian Ardennes, no less attractive than the part already enjoyed. And finally home via St Pancras International, East Croydon, and a pint of real ale in his local.

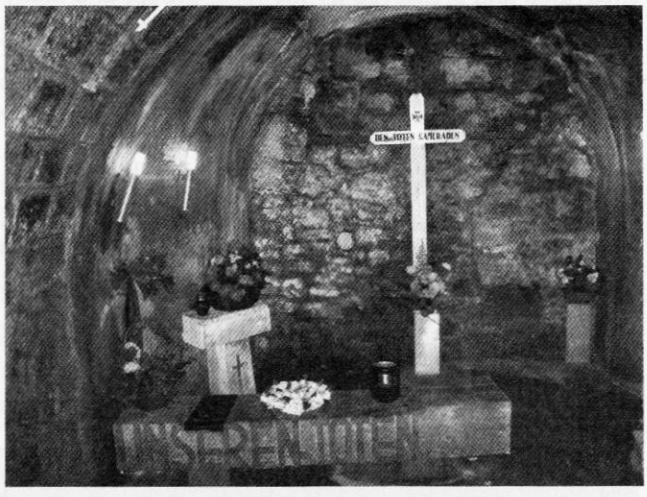
But back to the main party. Using a combination of Satnav and Stewnav we headed southwest on minor roads, crossing the border into France almost without realising it (the increase in petrol prices was the best indicator!).

We were aiming for a little town called Audun-le-Roman where a guidebook had mentioned the remains of a Roman aqueduct. Passing through the town we saw no aqueduct, no ruins and no helpful signposts, so stopped in a supermarket car park for a few groceries and a cup of coffee.

SB2 decided to return to Audun to track down the Roman remains, and with the help of the tourist office and some phone calls ascertained that the aqueduct was in fact underground (rather like the Roman *qanat* that we had investigated the day before in Walferdange), Linda, Martin & David found a café next to an old garage, where there might be an entrance to the *aqueduct*. The café was rather sordid, but its rather shifty clientele were quite solicitous. There was a good discussion about local mushrooms called *souchettes* and how a ring round the stalk meant the mushrooms are safe. But the aqueduct was not open except by prior arrangement. Something to bear in mind if we're ever in the area again.

Verdun

In SB1, we continued southwest and reached the forests north of Verdun in an hour or so. We found local road D130 through fields and woods that had seen such slaughter in 1916 and arranged to meet up again with SB2 at the Memorial Museum. Martin and Linda had thoughtfully bought picnic supplies for all six of us, while prior to the rendezvous SB1 had time to explore the hilltop Fort de Vaux, dating from 1881-84, where there was a small museum and some interesting underground galleries.



Bricked up magazine in Fort Douaumont, holding the remains of 679 Germans killed in an ammunition explosion. Photo by Martin Dixon

We had a quick look at the excellent Memorial Museum, and then drove to the huge Fort at Douaumont (even more impressive underground galleries). This was built in the mid-19th century and its design developed and was used in the Maginot line forts' construction. We then went onto the awesome WWI memorial known as the Ossuaire; the only underground here was thankfully inaccessible as it contains the remains of thousands of unidentified soldiers. Next up was the Tranchée des Baïonnettes. This, the first memorial to be built after the war, dates from 1920 and consists of a large concrete roof over an original trench containing the graves of valiant soldiers "who died standing, still holding their guns".

The scale of the dreadful carnage in this area was similar to that on the Somme, two hundred miles to the west, and the razed villages, ruined forts, shelters, cemeteries and memorials left a lasting impression on us all.

We reached the town of Verdun around 3.30pm and headed straight for the massive Citadel, which advertises an "underground tour". This turned out to be an interesting and unique experience, as the six of us were conveyed through darkened tunnels and galleries in an

automated carriage like something from Disney World. At each turn there was a lighted tableau, with displays and film projection, and commentary in English, featuring various aspects of Verdun and the First World War. The 40-minute tour ended with a recreation of the circumstances which led to the coffin of the 'Unknown Soldier' being selected at Verdun and conveyed to Paris for eternal glory under the Arc de Triomphe.

We liked the tour and its technology very much, although we were disappointed that no other parts of the Citadel were open to the public – "too dangerous", we were told.

We swiftly found our little hotel in the centre of the town, checked in and arranged to meet later for a recce of bars and restaurants. Our choice of a local *estaminet* brew-pub followed by a small local restaurant almost next to our hotel proved perfect in every way, and brought another rewarding day to a close.

Day 7 Final Day: Verdun, Ay, Epernay *by David Ferris*

Today was fun, like the other days. But not so subterranean as we'd planned.

The hotel at which we were staying, the Montaulbain, had an impressive gothicky-looking notice, explaining how the hotel was built on the site of a medieval prison, and cells remaining below. But our helpful manager, the wonderfully named M. Poirot, advised us that alas, there was nothing to be seen.

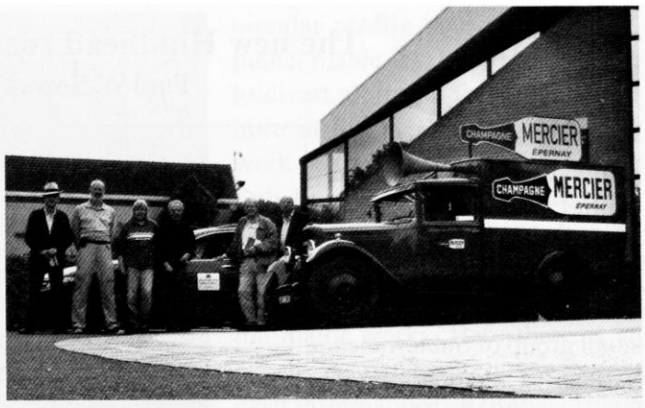
We visited the nearby art deco monument to the fighting at Verdun. A stylized medieval warrior sits at the top of a tower, looking forebodingly over the town, hunched over a large sword. A cascade of fountains follows down the steep hill, to the town centre. We visited the small crypt, as well as looking at the tower.

The monument isn't a monument to the dead. It's to everyone who participated in the year-long battle to stop the Germans take over the town. This was very bloody: 300,000 killed, and 450,000 wounded, including General de Gaulle. Verdun is a symbol, to the French, of the appalling and extended suffering they endured in the Great War, and also of their ultimate victory. This was something of a Pyrrhic victory as it turned out. Twenty years the Germans returned.

The Champagne region

We drove to one of the three champagne shipping towns, Ay. It's a small place. Some big brands, including Bollinger, Ayala, and Deutz, have big premises that presumably incorporate large cellars, or *caves* as they're called in French. But alas, none of the caves were open, there was nothing to be seen. Still, a nice strong coffee helped us along the way, and a bit of shopping in the local supermarket for provisions for the journey home.

So we drove on to nearby Epernay, the second of the great champagne shipping towns (the main one of the three is Reims). We headed for Mercier's caves. Mercier



The Sub Brit party outside Mercier's champagne cellars at Epernay. Photo by John Lill

has been in business since 1858. Since 1871 the firm has cut about 18 km of tunnels in chalk, to store and mature champagne. The tunnels have a number of innovations, and connect directly to the main railway network. We piled in to do the tour. You cruise around in a train for 50 minutes, after which they insist you down a few glasses of champagne. It's hard work, but someone's got to do it. But we had arrived at 12.05pm, and the tours stop for lunch from noon to 2.00pm. So alas, there was nothing to be seen.

It was now time to head for the chunnel. We stopped at a pleasant restaurant just outside Epernay, and had an excellent three-course meal with drinks for €12.50/£11.50 per person. SB1 and SB2 proceeded all the way in convoy though SB2 did follow the wrong Astra for about 10 km! Got to Sangatte at around 5.45pm, in time for our 6.20pm train. And so we plunged uneventfully into the best tunnel of the day, thinking about snacks and the best way to get home, rather than matters subterranean.

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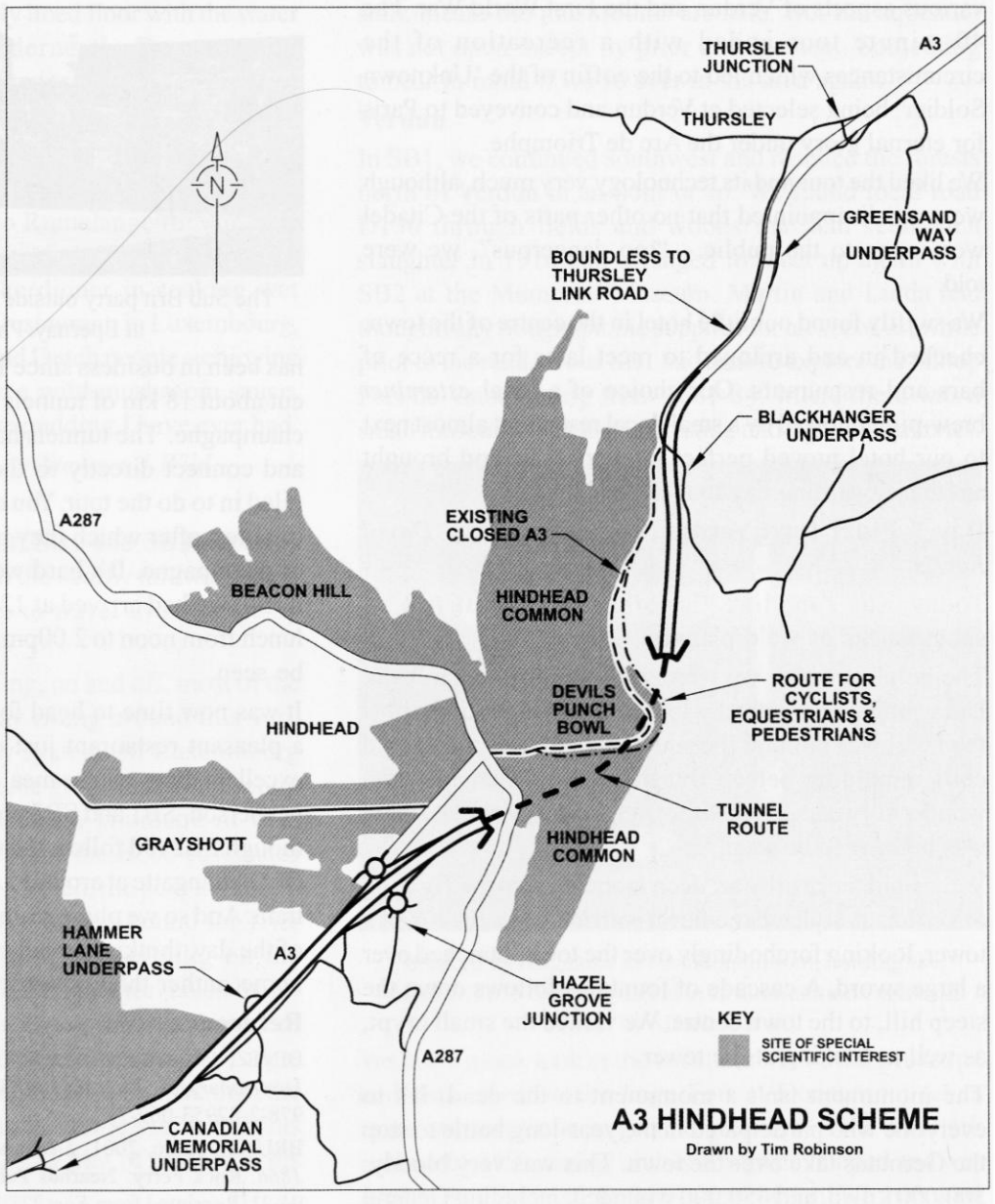
The new Hindhead road tunnel on the A3, Surrey

Paul W. Sowan and Martin Dixon

What will become the UK's longest under-land road tunnel, currently under construction in the vicinity of Hindhead in southwest Surrey, was visited by a small group of Subterranea Britannica members on 4 February 2010. The two bores lie within national grid squares SU35 and SU36.



Purpose and Timescale

The purpose of the 1.8 km tunnel is to relieve traffic congestion on the A3 Portsmouth Road, and to remove a busy major road from the surface at Hindhead Common and the Devil's Punchbowl, one of Surrey's most valued landscapes. Much of the stretch of the A3 to be by-passed will be removed, and the right of way converted to a bridleway. We did not ascertain to what extent sub-surface infrastructure, such as pipes and cables, is also to be removed.

The realigned A3, in the form of new approach roads and the twin-bore tunnel, will run to the east of the existing route, passing a maximum of 60 metres below ground level. A proposed similar landscape protection scheme for the A303 to by-pass Stonehenge in a 2km tunnel has as yet not been agreed upon. Road tunnels are exceptionally expensive to build and operate on account of the need for very efficient ventilation.

Work by Balfour Beatty started on site in January 2007 with site clearance and construction of the main project compound. Tunnelling started in February 2008 with breakthrough in both bores occurring in just over a year on 26 February 2009. Tunnel lining is now complete and work is underway on the installation of mechanical, electrical and drainage services. The tunnel is due to be handed over by the contractors in 2011 with an opening date later the same year. Nigel Headley has posted periodic updates to the Sub Brit email list; Nigel having a close interest as he lives further up the A3 in Wimbledon.

Construction

Three road-headers were used to make the tunnels, which are slightly curved, 1.8km long, and slope downwards to the south portals where there is a sump from which surface runoff water can be pumped. The bores are above the local water-table, and there were no significant problems with water ingress from above. Both bores were holed-through in March 2009, the rock encountered being sands and sandstones of the Lower Hythe Beds of the Lower Greensand. The top-heading pilot tunnels, when they were holed-through, were found to be exactly correctly aligned vertically, and only 20 mm out of alignment horizontally.

All the tunnel spoil, taken out by conveyor belts, is being used in associated work on the new road lengths at either end, such as making embankments (see side panel). There was relatively little overbreak in the tunnelling, the two bores being made successfully at almost exactly the

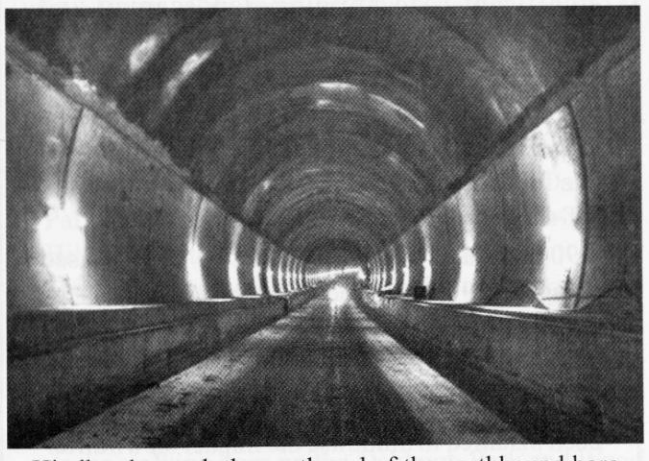
Final breakthrough

required diameter and profile before being lined with a shotcrete primary lining, followed by a reinforced concrete secondary lining. The approximately 20 percent concrete used in excess of the calculated requirement for the linings was accounted for by temporary support for the working faces, as well as that called for to fill-out oversize parts of the bores.

Operation

Cross passages are provided linking the two bores at intervals, to provide escape routes in the event of fire or other emergencies. Traffic inside the tunnels will be monitored 24 hours a day, 365 days a year, from permanently staffed control buildings at each portal. These buildings are themselves being buried to minimise their visual impact.

As well as conventional closed-circuit television cameras, special image-monitoring software will alert operators to any unusual events (eg stationary vehicles or those at unexpected attitudes). Ventilation will be by ceiling-mounted fans. Cable ducts will be buried in the back-filled and paved road deck in the lower third of the near-circular profile bores, with no in-tunnel manholes. It will be possible to divert all traffic through a single bore in the event of maintenance work or an accident.



Hindhead tunnel, the south end of the northbound bore looking north. Cable ducts will be buried in the back-filled and paved road deck in the lower third of the near-circular profile bore. Photo by Nick Catford

Sub Brit visit (February 2010)

We assembled at the Visitor Centre, located adjacent to the project offices on the southbound A3 to the north of the major works. Here there is an excellent small exhibition including clear information panels that explain every aspect of the project. There is also a professional 3D architect's model which shows the tunnel and all approaches in great detail. The Visitor Centre is open to the public Monday to Saturday between 0900 and 1600hrs.

Recognising us as a specialist group, Balfour Beatty had arranged for us to be shown round by Dave Carver and Shane Hopper, respectively Chief Tunnel Engineer and Tunnel Shift Leader. This made the visit particularly interesting as they were able to answer our detailed questions with ease. We were told that we would be unable to enter the tunnel itself due to work in progress which was obviously a disappointment. We embarked a four-wheel drive minibus – essential due to site conditions and which would be a tempting asset for Sub Brit!

South portals - Photo by Nick Catford

We were driven to the north portal of the tunnel, seeing en route the groundworks for the approach road. The roadway was a sea of mud but was being consolidated with the addition of lime prior to a three-layer road surface being laid. The embankment sides were stabilised with matting and the hillside above the portal had rockbolts in place. The portals themselves were located underneath huge cylindrical canopies that had been cast in situ. These canopies will eventually be covered by earth as the hillside is re-profiled.

After repositioning the minibus at a range of angles for the photographers amongst us, we retraced our steps

and drove across to the southern portal. There we could see concrete batching and transport in progress to complete the secondary lining of the southbound tunnel. At this stage we were delighted to learn that although we wouldn't be able to make a through trip, a short excursion into the tunnel would be possible. We drove perhaps 250 metres into the tunnel along the 'true' invert. Service ducting was in cast sections either side of the tunnel and it was obvious that the eventual roadway would be a metre or more higher than our current level. Despite having to remain in the vehicle, windows and doors were opened to improve the view to all sides. We could see the slow descent to the sump level and had a view through cross passages to the second bore. As we were in the narrow bottom invert we had to reverse out of the tunnel with a banksman – the end of a short but fascinating underground trip. Expressing our thanks to our guides and driver we returned to the Visitor Centre for the obligatory group photo in front of the last remaining tunnelling machine.

The Sub Brit party and our guides beside one of the three road-headers.
Photo by Nick Catford

North portals - Photo by Nick Catford

Future plans

The road-headers are all going on to other tunnelling projects in Germany, Israel and Japan. At least one of our tunnelling-engineer guides, living conveniently nearby at Elstead, was contemplating future work on the intended Crossrail tunnels under central London, and perhaps not relishing the idea of negotiating the London rush-hour traffic on his way to and from work!

The Visitor Centre is recommended to anyone in the region; there are also two surface viewing platforms which provide views of the portals from a distance. The northern such is accessed from opposite the National Trust car park and the southern one from a footpath off the A3 just opposite Headley Road.

Official opening to public traffic is expected in the summer of 2011, when all work on the road deck, cables, lighting and ventilation equipment is completed. It appears likely that a sponsored event on foot and bicycle will be allowed before then, to raise funds for charities. Our Chairman is in touch with the Local Authority with a view to Subterranea Britannica helping with the stewarding of such an event.

We are grateful to Balfour Beatty for arranging our visit and for supplying such knowledgeable and approachable guides.

HIGHWAYS AGENCY, 2003, *A3 Hindhead Scheme. Explanation of the scheme and non-technical summary of the Environmental Statement*. Highways Agency: 8pp colour printed folded leaflet [Includes map and details of proposed road tunnel].

Facts and Figures

- As well as the tunnel itself, the project involves significant road building, landscaping and environmental activity.
- Over 1,200,000 cubic metres of earth and rock will be excavated of which 330,000 is from the tunnel itself. All of this material will be used on-site for embankments and screening, minimising off-site lorry movements.
- 90,000 cubic metres of concrete will be used along with 97,000 tonnes of asphalt.
- Around 200,000 trees and shrubs will be planted as part of the landscaping
- 100 dormouse nest boxes and 171 bat boxes have been installed to minimise the impact on wildlife.
- Over 100 kilometres of electrical cabling will be installed to power and control lighting and safety systems within the tunnel.

The Tunnel-Tiger's Tale

Stewart Wild

I was recently browsing in the Cyprus Road archives [Editor's note, Stewart's home doubles as a reference library!] when I found a series of articles published as an occasional paper in 1980 by my local archaeological society. They comprised a number of accounts compiled and edited by local historian Percy Reboul following tape-recorded interviews with elderly residents of the London Borough of Barnet who were invited to place on record memories of their childhood and working life.

They were all fascinating recollections of people from widely diverse occupations such as baker, dentist, nurse, bricklayer, printer, shopkeeper, policeman, housewife and postman. However, the account which I found especially interesting, and which I would like to share with Sub Brit members, was the reminiscences from an urban miner, who was paid a guinea per 12-hour shift for digging tube-train tunnels by hand.

Underground tunnelling work in progress near Finsbury Park on the Southgate extension of the Piccadilly line. Several tunnel miners are at work at the tunnel face within a Greathead shield

In those days, tunnel miners were popularly known as Tunnel Tigers. Here, reproduced with permission and as a tribute to this anonymous miner, are his memories of a working life underground in Britain between the two World Wars.

"I was born in 1901 at Stepney. My father was a tunnel miner too, and when he worked on the Oakleigh Park and Wood Green tunnels we moved to Muswell Hill. I went to Cromwell Road school and left at 14. My first job was with my father. He was working on the Post Office Tube Railway which runs from Paddington to Mount Pleasant and that was my first time underground. My grandfather was also a tunnel miner and he was what they call the 'walking ganger' or the walking boss on the Oakleigh Park and Wood Green tunnel and my father worked with him as a leading miner.

I started off as a tea boy for about a year and gradually went down the tunnels with my father driving a little cart pulling out the muck as the miners got it out. In those days we did about five feet of tunnel a day. We worked two 12-hour shifts, one on day and one on night – 6.30 in the morning or 6.30 at night – six days a week. We worked a week of days and a week of nights. Pay was a guinea a shift but when I first started I got fifteen shillings a week.

The work is as dangerous and as hard as coal mining although they work in a smaller space. Average tunnels are 12 feet 3 inches; the first one that was done was 10 feet on the old City and South London – what they called the 'tuppenny tube'. I worked on enlarging that original tunnel.

In my early days there was no protective clothing. In some places, if you were in bad ground and had to have compressed air put in (to keep back the water), you could be working in a temperature of 80-90° F but come outside the airlock and it would be freezing. You come out every eight hours if you are working in compressed air.

We worked by candle-light. The candles were put in a metal holder with a spike which you stuck in the ground. The gang would be given a packet of candles as they went down and you lit as many as was necessary to see the job.

My father walked from Muswell Hill to Hackney Wick every day just to get to work. He would get up at about 4am. There was no transport then as there is today.

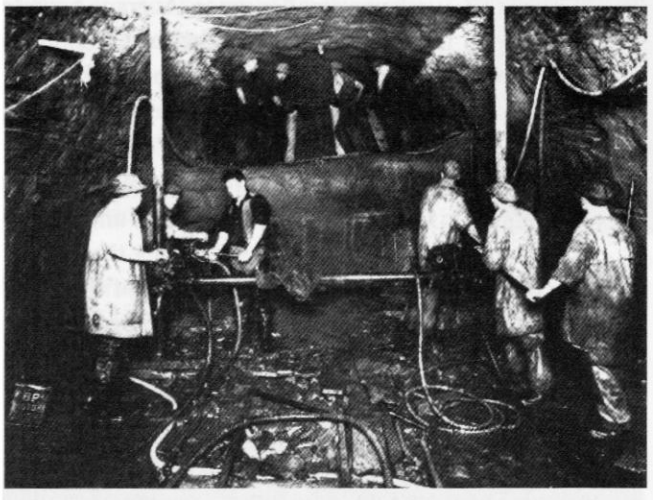
The miners were generally fit men. I've never had a serious illness. You were not allowed to work in compressed air if you had a cold. You had to go before a doctor before you went into a tunnel and the doctor would say 'not today' and you had to go home. You could take cigarettes into work and occasionally they might take a bottle of beer.

On tunnelling you have eight men in the gang: one leading miner, three miners and four back-fillers who load the muck into skips which are pushed on rails out of the pit. I was an Inspector on part of the Central Line tunnels and one of my jobs was to check the line and level of the tunnels. This was done by two plumb-lines fitted up by the civil engineers. One line is on the face of the tunnel and one back about 20 feet. You line up the two and a good miner never goes wrong.

About 1934-35 I worked for Charles Brand on the Finsbury Park to Cockfosters Piccadilly Line underground tunnel. We were paid a guinea a shift. The tunnel runs from Finsbury Park through Wood

Green and into the open at Arnos Grove. I was leading miner at Wood Green. Just beyond the station is what they call a cross-over road where the train changes direction. It's a telescope tunnel which gets gradually bigger starting at 12 feet then through 14 feet and 16 feet until it gets to 27 feet.

I was an inspector on the Liverpool Street to Newbury Park section of the Central Line. I was employed by the Consulting Engineers and we were seventy feet down in the London clay which was good ground. I had to make out a report every night on the nature of the ground or strata.



Mersey Tunnel workers at the Rendel Street heading, Birkenhead in 1928

The Mersey Tunnel

Tunnel miners are proud of the Mersey Tunnel, it being the largest under-water tunnel in the world: 44 feet in diameter. For a start we dug three ordinary tunnels right through – a bottom one to take surplus water coming through crevices in the rocks. At one point we were only three feet below the bed of the river. We built the first 100 'rings' by hand, no machinery. My father was in charge of that. He was the head ganger. My father, my two brothers and myself each had a gang – with 24 people to the gang. A lot of them were Irish (being Liverpool) and we were picked men.

One day I was on the top of the tunnel bolting on a metal segment when the spanner slipped and I fell face-first onto the rock below. We had three or four people killed. The Labour Exchange sent thirty men to the shaft, every shift every day, in case anyone regular didn't turn up for work.

Tunnel Tigers are a particular breed of men – it's in the blood. My father was classed as the finest clay miner in London although he did say he thought I was better. You're all a happy gang together, laughing and singing as you work. Now they have a transistor radio.

Today it's all mechanical work – a lot easier. I've come home on a morning with my flannel shirt so soaked in sweat that you can wring it out. Most miners wore flannel shirts for warmth and for soaking up the sweat.

We were more content in the good old days."

The intended Liverpool and Birkenhead Subway

Paul W Sowan

On 7 November 1890 one Major H F Mills addressed the Liverpool Chamber of Commerce on an intended Liverpool & Birkenhead Subway. This was proposed to provide a convenient road link between the docks on both sides of the Mersey, at a time when all goods traffic was horse-drawn. I have as yet discovered nothing more about Mills.

The proposed tunnel under the Mersey was of course never built, although it had the support of the Liverpool Cartowners' Association. There was in the event no provision for road traffic under the Mersey between Liverpool and Birkenhead until the Queensway tunnel was opened in 1934. A second road tunnel (Kingsway) was opened in 1971.

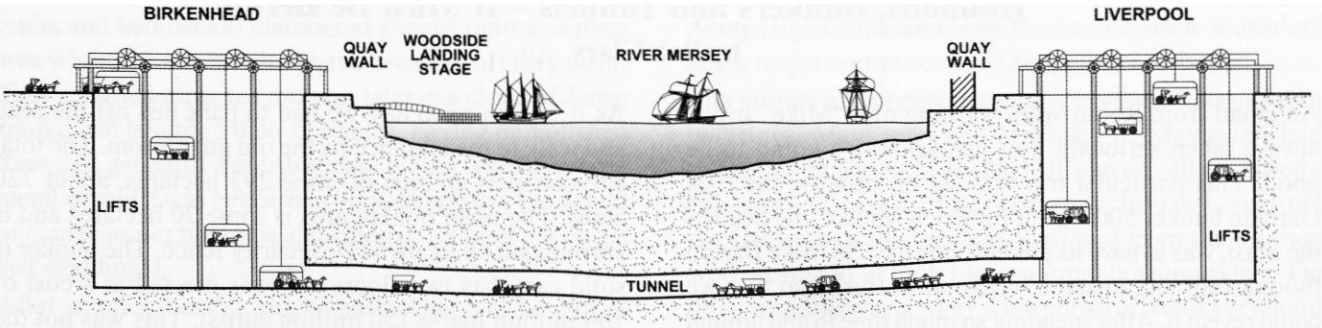
The Mersey Railway tunnel (2,700 yards) had already been dug in the years 1879–86, as a result of which in 1890 the nature of the river bed to be bored through was of course known.

As can be seen from the illustration from the printed version of Mills' address, the under-river subway was intended to convey horse-drawn vehicular traffic. Mills' longitudinal sectional diagram indicates that the vehicles were to be raised and lowered at each end of the tunnel by means of lifts.

This Liverpool to Birkenhead road tunnel scheme had its origins in 1880, in which year at the instigation of one Christopher Bushell an Act of Parliament authorising construction was obtained. The first plan was for a tunnel a little over two miles in length, within 150 feet of the Mersey Railway tunnel (which had been opened in 1886), and with a circuitous incline three-quarters of a mile long at each end.

Tunnel specifics

The 1890 plan, following further Acts in 1885, 1888 and 1889, was modified, the intended ramps at each end being replaced by eight hydraulically operated lifts to the surface



SECTIONAL VIEW OF THE TUNNEL & LIFTS
Drawn by Tim Robinson

near St George's Dock at Liverpool, and the same number at Hamilton Square in Birkenhead. Most of the lifts were to have had a floor area of 45 feet long by 12 feet wide, but two at each end would be 60 feet long to accommodate the longest vehicles. The tunnel, lined with cast-iron segments, would have an internal diameter of 24 feet six inches, allowing for a roadway width of 19 feet. Elimination of the inclined access roadways at each end would result in the tunnelling being about a half of the originally envisaged length. Lighting was to have been by electricity.

The cleanliness of the road would, it was claimed, have been 'provided for by channels leading into the culvert below, from which the drainage will be forced by the hydraulic power which actuates the lifts; the same power will provide perfect ventilation by forcing a sufficient supply of fresh air suited to the requirements of the traffic'.

In an 1890s road tunnel, used by horse-drawn carts, provision for keeping the roadway clean would of course have been an important consideration. There seems to have been no suggestion that a water supply would have been provided to assist in that matter.

The nature of the ground to be tunnelled through, red sandstone, would have been known as a result of driving the Mersey Railway Tunnel a few years earlier.

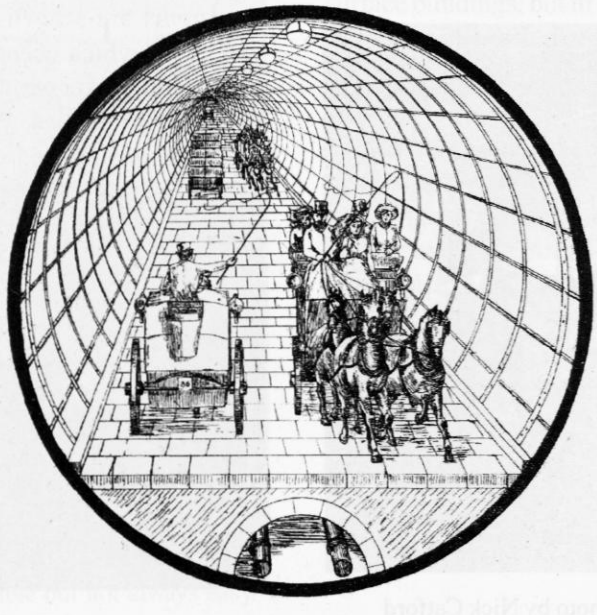
Passenger traffic

Although primarily for freight transfers, the proposed subway would also have had a role in passenger traffic. Mills pointed out that the Great Western Railway, drawing traffic from its 2,500 miles of lines, had its northern terminus at Birkenhead. Passengers bound for the north-bank city than had a choice of taking the steam ferry, or transferring (by lifts) to the Mersey Railway. The option of taking a cab from the GWR terminus direct to any address in Liverpool would have been an attractive one.

It is commented of the Mersey Railway, as it then existed, that it accommodated passengers only, and that only three and a half miles (of an intended final total of six miles) had been opened to traffic.

References

MILLS, H.F., 1891, *Address on the Liverpool & Birkenhead Subway* delivered at the Liverpool Chamber of Commerce, 7 November, 1890. London: Lake & Son (printers): 40pp.



Hobnobs, Bunkers and Tunnels – It Must Be Berlin!

by Bob Clary

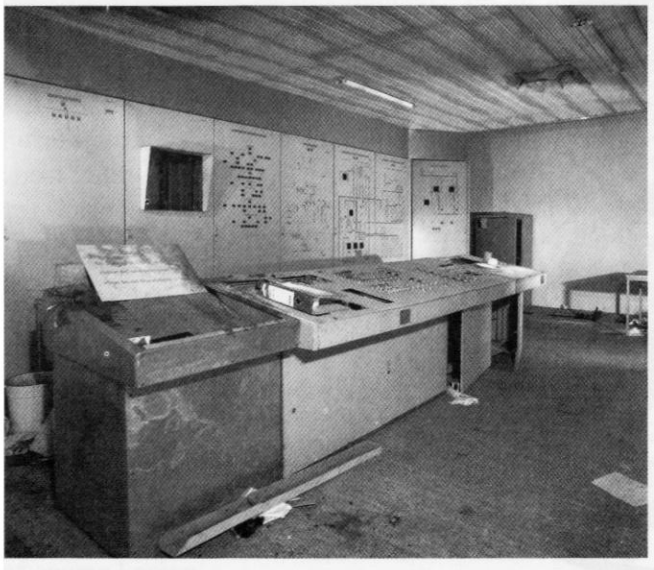
An email from Robin Ware warning of a "Mike" trip is always taken seriously, you just know it's going to be good. This particular trip was set up because the East German bunker 5005, built for Erich Mielke, the head of the Stasi, was to have its annual open day. So Mike Barton thoughtfully organised a weekend in Berlin so that we could revisit it. After spending so much time in and around Honecker's 5001 over the last year it was going to be good to get back to more modest bunkers.

The weekend began with an early start from Stansted on a misty March Saturday morning to catch the 06.25 flight to Berlin Schonefeld. We arrived in Berlin on time to the usual Ryanair fanfare of self-congratulation and made our way to pick up the mini-bus which was to be our transport for the two days.

We, by the way, were Robin Ware, Jane MacGregor, Tim Robinson, Gavin Saxby, Gary Page, Steve Underwood, Tony Page and your scribe Bob Clary. We picked Mike Barton up at Bernau railway station; he had flown up from Bavaria, where he lives, to Berlin Tegel.

Our first port of call was to 5005 which most of us had been to before, if not for a few years. While the order of the day was for guided tours for large groups of Germans by the curator Paul Bergner, Mike had organised for us to have free run of the bunker as long as we kept out of the way of the tours. It turned out to be an excellent arrangement; we photographed and explored every nook and cranny.

The 5005 complex is located to the northeast of Berlin about 3 miles NE of the Honecker Bunker, 5001. It was completed in 1988 shortly before the collapse of the GDR and thus saw little, if any, use. We approached the site from Biesenthal; all that can be seen from the road is the wire fence around the complex.



Plant control room in 5005. Photo by Nick Catford

As it was an open day we had to park just off the road and walk to the entrance by the old guardroom. The total site occupies an area of some 293 hectares, about 720 acres. The inner bunker area is some 20 hectares and is surrounded by its own HV security fence. The bunker is solid cast, has two floors and was erected at a cost of 100 million marks (50 million euros). This was not the largest East German bunker but, being the newest, was the best equipped.

The "accommodation" building in the inner area was the HQ of the site and would have been used in normal circumstances. Access to 5005 was via its cellar which was bunkered similar to 5001. At one end of the cellar a series of hermetically sealed doors led to the 5005 via a 50-metre tunnel. We entered this tunnel via a hole that had been cut in its roof outside the building, the route from the accommodation block having been blocked.

The bunker measures 49.2 metres x 29.4 metres and provides a net floor area of 2,500 m″ spread over the two levels. The operations area is located on the upper level within a rectangular "ring" corridor which has further offices on its outer perimeter, a form of crunch zone for the core rooms. The standard sliding map walls can be seen here, with an adjacent control room. Mielke's office is located to one side, next door is his adjutant's room and nearby are Mielke's private rooms.

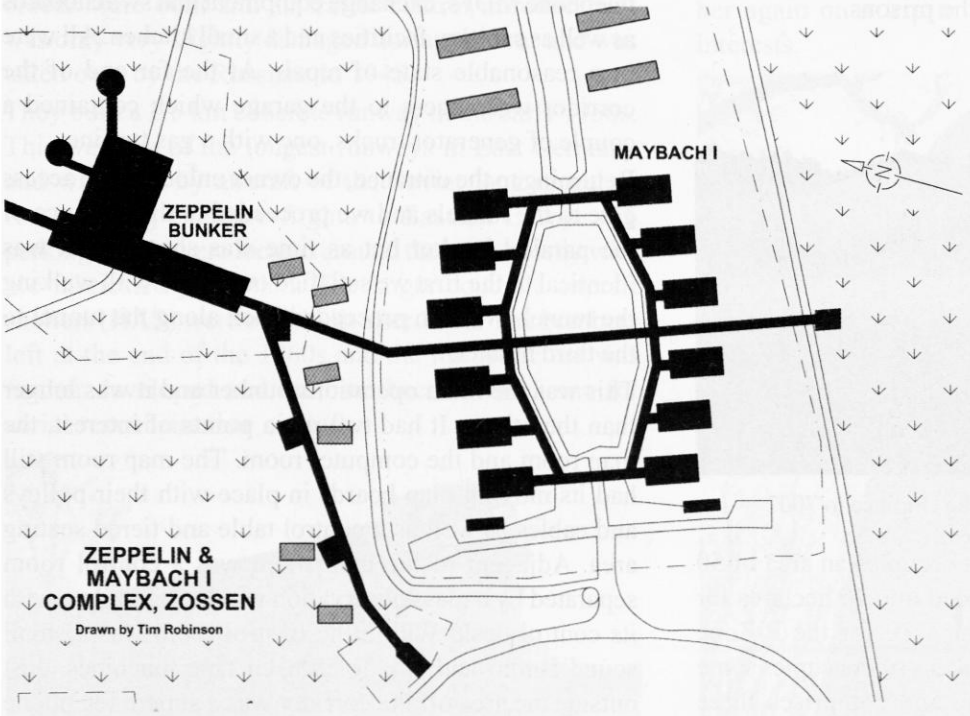
Two stairwells lead to the lower level which mainly houses the usual technical support services: dispatcher (the bunker controller), electrical distribution, air conditioning and telephone exchange. Power would have been generated by three marine diesels, each providing 400 kVA. The interior decor here was somewhat more spartan than that found on the upper level.

We spent about 2 hours exploring the bunker. Many of the rooms are strewn with debris left over from the vandalism which occurred when it was less secure. On leaving the bunker we wandered over to a small exhibition of military vehicles. We were quickly offered an off-road trip on a tracked vehicle for ¸5 each, quite a snip.

Tracked vehicle ride

Most of the group (the younger members without fragile limbs and bad backs) clambered aboard onto a seating area where the turret should have been and off they went. They returned some ten minutes later in a cloud of dense smoke and laughing their heads off, having demolished trees and generally contributed to global warming. One member said it was better than his wedding day (he would of course prefer not to be identified or it might not be his last wedding!).

After a quick lunch, which most of us had bought at Stansted, we made our way to Zossen Wunsdorf for a look around Maybach 1.



The 1930s saw Zossen-Wünsdorf being developed as a major command centre for the German army for WW2. At this time the command centres for the armed forces were still located in Berlin but because there was no room for development there it was decided to move the Army High Command from Berlin to Zossen-Wunsdorf and a major comms centre (Zeppelin) was built.

The project also incorporated 23 "cottages" arranged in two rings, Maybach I and Maybach II: Maybach I had twelve cottages and Maybach II eleven, all of exactly the same design. The cottages housed various departments of the General Staff and from the air they were designed to look like a normal housing estate. On the ground, however, they were constructed of very solid concrete, in places a metre thick, with two floors above ground and two below, the lowest level being linked by the Ring Tunnel which has a total length of some 600 metres. Maybach II also had a ring tunnel connecting its cottages.

Tiles were stuck onto the thick concrete roofs and chimneys were added which served as exhausts for the ventilation. The outer walls had conventional windows installed, while the gable ends were finished off with proper brickwork over the concrete. Gardens were laid out for each cottage together with a terrace area. The outer steel doors were covered with a mock wooden panelling.

The purpose of our visit was to explore the Ring Tunnel. We entered it via a hole in the ground located between cottages A 1 and A 2. The tunnel linked the reinforced cellars of the twelve "cottages" mentioned above. Under normal circumstances personnel would work in the surface buildings, but in the event of an air raid they could descend to the cellar and continue their work there. The ring tunnel and its cross-tunnel provided convenient access to Zeppelin and from the South entrance bunker. The tunnel is walkable except for its top left section which is filled almost to the roof with sand. While four members of the party managed to squeeze through the gap, the author and two others failed the test. Apparently the experience is delightfully claustrophobic, especially since it is not very easy to engage reverse gear once you are trapped between sand and roof. I explored the tunnel as far as I could and then had a look around the outside buildings. The others managed to find another way out which didn't involve returning through the pinch point but it was too late, we had run out of time. So the rest of the tunnel will, for me, have to wait for another trip.

The Maybach 1 tunnels are passable but not always easy. Photo by Nick Catford

This was the last trip of the day, so it was off to the "Hot Rocks" hotel for a night of beer, steak and sleep, not necessarily in that order.

Sunday's first trip was to bunker complex 7001 which was new to all of us except Mike. It had kindly been opened specially for us by its caretaker Herr Habart.

Bunker 7001 is situated just outside Freudenberg some 3 km north of the B185 to the NE of Berlin. Its purpose was to provide shelter, in the event of a war, to the Ministry of the Interior (Ministerium des Inneren, MdI – our Home Office) which was responsible for all the police forces in EGER (uniformed, CID, transport, water, traffic, etc.) as well as the fire brigade and the prisons.

The surface building above the entrance to 7007

The bunker complex, aka 7007, occupies an area of 50 hectares (about 130 acres), divided into 20 hectares for the U-Zone (accommodation) and 30 for the P-Zone ("park" or bunker zone). The bunker itself occupies some 2.6 hectares within the P-Zone and comprises three constructions of bunker type MB/BS STB 81.

The two parallel bunkers are some 50 m long and 14 m wide. They each have a 25 m bunkered garage at one end. Access is via the tunnel system connecting all bunkers or by the individual entrances. The bunkers are of the cut-and-cover type and have barrack buildings at ground level.

The bunker to the right is 88 m long and 14 m wide. This was the business part of the complex and housed the map room or situation room. Comms facilities, services management, and operations rooms were also located here. The access tunnels are linked to the cellar of the normal HQ building some 260 m away. This provided normal access to the bunker complex, whereas in an emergency access was also possible via the garages or the individual access points.

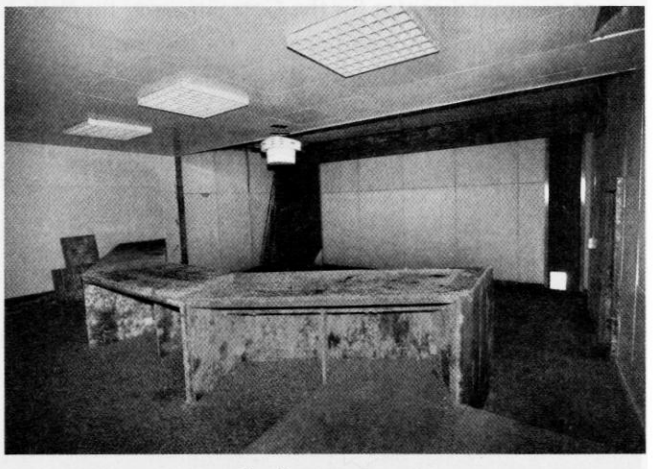
Planning and construction was from 1984 to 1988, at a cost of 58 million marks (29 million euros). The complex was designed to survive for three days and could have been hermetically sealed for up to ten hours. Some 200 officials and technical personnel were to have been housed here.

We entered the first of the parallel bunkers via its external access stairs at the bottom of which is gated access to the tunnels connecting to the other two bunkers. Going straight ahead leads to a sequence of four blast doors. Access to the diesel generator room is on the left between the second and third blast doors after which you enter the bunker at one end of its spine corridor.

The electricity was still on in the bunker (as proved by Mike's reaction when he inadvertently touched an exposed 3-phase bus-bar) and most areas were lit. We explored all the rooms off the corridor which contained all the usual services, air conditioning plant, gas filtration, telephone MDFs, exchange equipment and switchboards as well as sanitary facilities and a small kitchen. All were in a reasonable state of repair. At the far end of the corridor was access to the garage which contained a couple of generator trucks, one with a gas turbine.

Returning to the entrance, the owner unlocked the access gate to the tunnels and we proceeded to the entrance of the parallel bunker but as time was short and it was identical to the first we satisfied ourselves with walking the tunnel. We then proceeded back along the tunnel to the third bunker.

This was the main operations bunker and it was longer than the others. It had two main points of interest, the map room and the computer room. The map room still had its moving map boards in place with their pulleys and cables as well as a control table and tiered seating area. Adjacent to the map room was a control room separated by a glass observation window complete with its control desk. Within the control room was a small sound studio and two Telefunken tape machines. Just outside the area off the corridor was a superb telephone kiosk.



Conference room

The computer room was still equipped with processor cabinets, control consoles and printers. All very large and basic by today's standards.

Herr Habert had given up his Sunday morning to let us in and we were very grateful to him for letting us see this excellent bunker.

After stopping for a traditional sausage lunch at a petrol station we made our way to the next venue, Werneuchen Airfield, where were to be met by our guide Christel Focken. She was going to take us around some of the airfield's buildings.

Werneuchan is located some 28 km NE of Berlin and during WW2 it served as a Luftwaffe airbase. It had previously been used by Lufthansa as a maintenance and construction base. Prior to WW2 it had only a grass runway, but towards the end of the 1930s its infrastructure was improved dramatically: nine huge hangars were constructed (seven still stand), a tower and large barrack blocks were built and air traffic control introduced. It was only very slightly damaged during the war and was taken over by the Russians in 1945.

They built a 2.5 km concrete runway in the early 1950s. This was one of the longest runways in East Germany and was used by aircraft of the Soviet long-range air force during exercise flights to Eastern Europe. 35 parking stands were located around the base, mostly with pre-fabricated protection. The larger concrete aircraft shelters (HAS) were only built after 1968. The bombers left at the end of the 1960s and the infrastructure was further developed and the base became the home for aerial reconnaissance aircraft.

Control tower

Soviet aircraft and helicopters started leaving Werneuchen in July 1990 to return to the then Soviet Union until final closure in 1994. The base is now largely derelict but still used by a few private flyers.

Having met Christel in the Lidl car park we drove into the airbase, parked the mini-bus and started our walk around the base. We began with a look at a "Granit" nuclear weapons store similar to one we saw last year at Grossenhain on Mike's "last" tour. We immediately restarted an unfinished discussion on why the doors had been fitted the way they were; bowed side facing inwards. Mike sensibly stopped further discussion of this point.

The Granit store was being used as a shooting range by a local rifle club so we couldn't go in but we had an extensive look around the outside. Original camouflage paint was in evidence on its back walls. We then moved on to the hangars most of which were open and derelict except one which was being used by a local flying club.

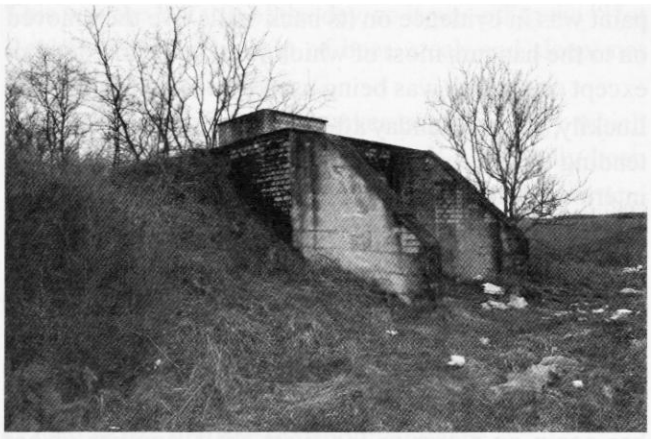
Luckily, being a Sunday afternoon, some members were tending their aircraft so we could go in and inspect the interior and the door mechanisms. Next was the control tower which was locked and unsafe so we proceeded to the old boiler house which Christel is hoping to turn into a museum if she can raise the funds. Finally we walked to the command centre, a large cubic block of windowless concrete.

We said our goodbyes to Christel perhaps hoping to meet her again on a trip to the West Wall, another of her interests.

Radar Tower

Mike now took us the short distance to Weesow where an old radar tower and observer position are located. The radar tower is circular, about 5 metres in diameter tapering slightly to its roof, and about 20 metres tall. The radar would have been mounted on its roof and been capable of rotating. The tower was locked shut so we could not enter it but we could see shell holes at its upper levels which were evidence of the advancing Russian army putting everything out of action as they passed through the area in 1945.

Nearby was a later Cold War observation post built in the 1950s with a similar function to our ROC posts. This was open and consisted of a single room with an



Observation Post

observation cupola. It was full of rubbish from sleeping tramps so we didn't stay long.

It was now about 3 o'clock and we had a couple of hours to kill before going to Schonefeld for our return flight. I suggested going to 5020 which was only about 15 minutes away. Everyone agreed so off we went.

5020 was the transport bunker in support of 5001 and 5005. It would have ferried VIPs from Berlin to their bunkers and from the bunkers back to Moscow if necessary. It had heliport facilities as well as many garages for protected road transport.

I had been there before as had Mike but the others hadn't. We approached it from a public track and I realised straight away that something was wrong; the protective fencing was in the process of being removed. We went to the access point and I was surprised to see that the traditional concrete road slabs had been removed and stacked up. At that moment a JCB came into view and approached us. Now this is the moment when you're glad you've got a German-speaker with you!

Mike engaged the driver in conversation and quickly determined that he couldn't care less about us being on the site! He was running late on his demolition contract and was working on a Sunday to try and catch up.

We started exploring the site by making our way to the old garages whose doors had been earthed up. These were semi-submerged with a single-storey barrack building on their roof very similar to the bunkers at 7001 that we had visited earlier in the day. Luckily the emergency escape hatch was open so we could venture inside. The bunker consisted of a long central corridor with rooms off either side leading to the garages at the end via a sequence of blast doors. The garages were, not surprisingly, empty as were most of the rooms but some artefacts were in evidence: mainly remains of the infrastructure such as ductwork, pipes and the telephone frame.

We next moved on to where the helicopter control tower and landing pads had been. I was shocked to see that the control tower had been completely demolished, including its foundations. Nothing was left. The site was in the process of being completely erased from the surface of the earth. It was very sad to see, but that's the way the Germans treat their history that they'd rather forget.

We now had to make our way back to, firstly, Tegel airport to drop Mike off and then to Schonefeld. We had our usual meal in the Movenpick restaurant at Schonefeld where we discussed the weekend. We all agreed it was the end of another fine trip!

References:

Geheime Bunkeranlagen der DDR by Stefan Best, ISBN 3-613-02332-6

Photos by Bob Clary unless stated.

Rare timber-lined Air Raid Shelter uncovered in Downend, South Gloucestershire

Recent archaeological investigations, by the Avon Archaeology Unit, on a development site at Downend, South Gloucestershire, seeking a possible Roman villa, surprisingly uncovered the traces of a rare timber-lined air-raid shelter, possibly pre-dating World War II by a couple of years. The shelter consisted of a zigzag trench together with its sloping approach, and was adjacent to a former school. It was cut into the subsoil with timber lining and the contents included bases for chemical toilets. Timber-lined and roofed shelters such as this are known from the northwest of Spain, the zigzag being intended to minimise casualties upon a direct hit, but no excavated examples are known from Britain. A military button and an enamel plate were recovered from the trench.

Despite popular belief that Britain was unprepared for war in 1939, regulations for air-raid defence were put in place shortly after the Munich crisis of 1938 and the present example may date from this time. It is likely that many other examples are present in the UK but their ephemeral nature and the fact that many were replaced by more permanent examples means that no other examples appear to have been reported. A full report on the shelter is currently being prepared.

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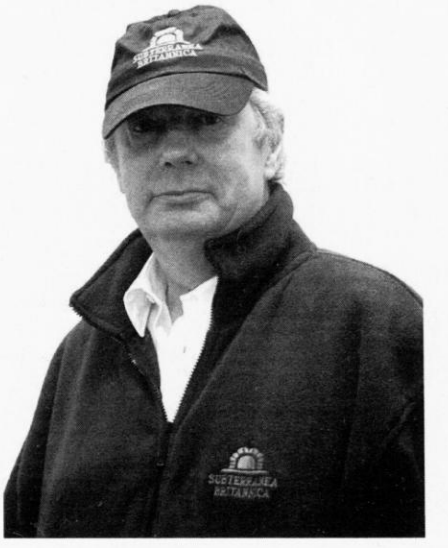

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